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The Journal of the Society of Dyers and Colourists

Volume 74 Number 11

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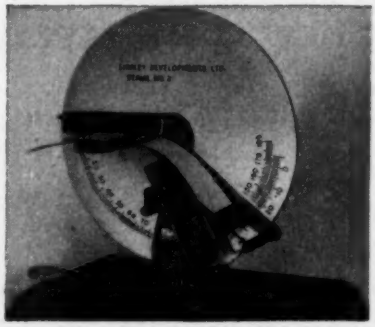
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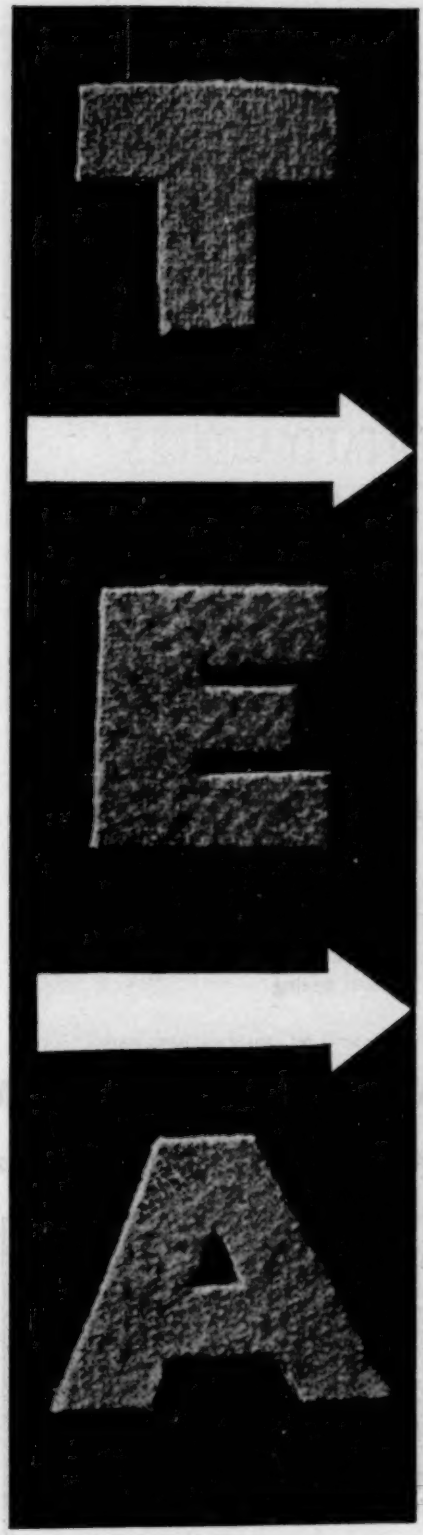
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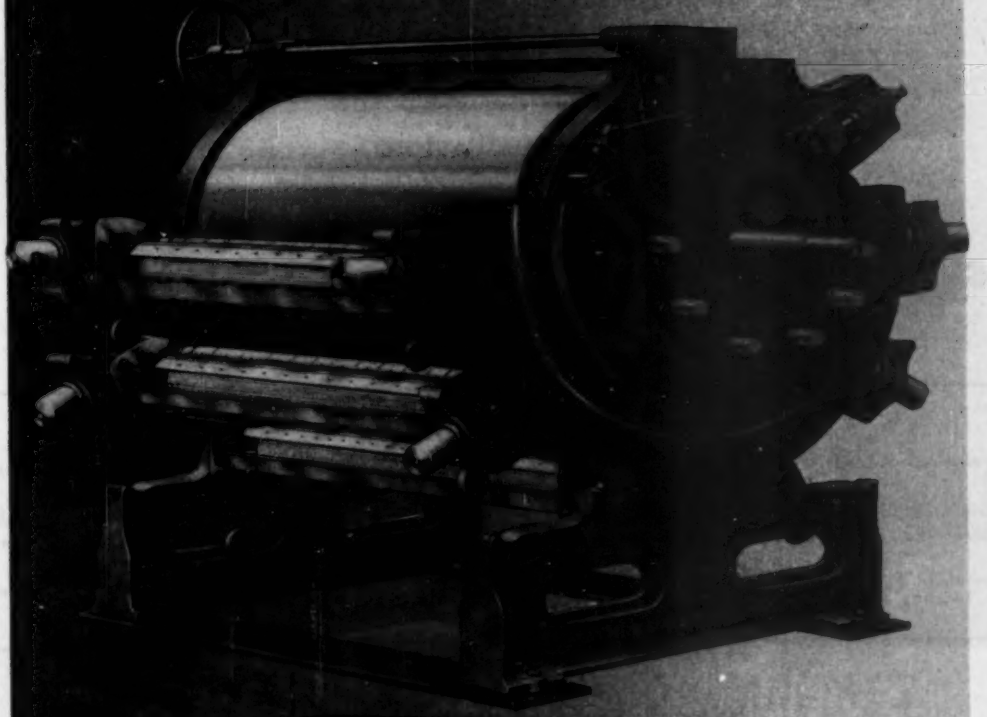
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NOTICE TO MEMBERS AND SUBSCRIBERS

Readers requiring *general information* regarding the Official Notices, List of Officers of the Society, etc, should consult pages 1–7 of the January 1958 and pages 509–516 of the July 1958 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire (*Telephone* Bradford 25138). *Editorial Communications* should be addressed to *The Editor*, at the same address.

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

LECTURES

Some Chemical Foundations of Fast Colour Printing — *F. R. Alsberg, W. Clarke, and A. S. Fern*

The Determination of Damage to Wool Fibres — *J. C. Brown*

The Life and Times of Peter Griess — *W. H. Cliffe*

The Finishing of Tricel Cellulose Triacetate Fabrics, with particular reference to Setting, Embossing, and Pleating — *A. S. Cluley and S. N. Bradshaw*

Water-repellent Finishes—Modern Use of Silicones — *G. W. Madaras*

Developments in the use of Phosphorus-containing Resins for producing Flame-resistant Finishes on Cellulosic Fabrics — *J. W. R. Perfect*

Flameproofing of Textile Fabrics with particular reference to the Function of Antimony Compounds — *N. J. Read and E. G. Heighway-Bury*

Some Experiments on the Effect of Dye, Fibre, and Atmosphere on Light Fastness — *G. Schwen and G. Schmidt*

COMMUNICATIONS

A Study of the Spectral Dependence of the Fading of Dyed Textiles — *R. E. Bedford*

Adsorption at Organic Surfaces
V—A Comparison of the Adsorption of Solutes by Cellulose and Chitin — *C. H. Giles and A. S. A. Hassan*

EXPLANATORY PAPER ON MODERN THEORY

Surface Activity, Solution, and Adsorption — *C. H. Giles*

NEW MEMBERS

Persons desirous of joining the Society as Ordinary Members or Junior Members can obtain Application Forms from the General Secretary, or from the Honorary Secretary of any Section of the Society

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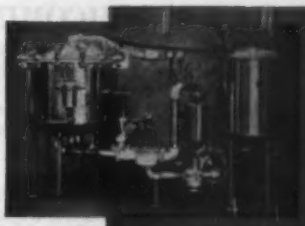
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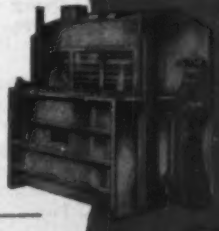
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FORTHCOMING MEETINGS OF THE SOCIETY

Thursday, 27th November 1958

WEST RIDING SECTION. *Photoelectric Colorimeters— Their Uses and Limitations in the Dyehouse.* J. V. Alderson, Esq., B.Sc., A.R.C.S. (Imperial Chemical Industries Ltd.). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Tuesday, 2nd December 1958

LEEDS JUNIOR BRANCH. *The Dyeing of Wool-Fibro Blends.* Miss E. Smith. Lecture Theatre, Department of Colour Chemistry and Dyeing, The University, **Leeds.** 3.15 p.m.

SCOTTISH JUNIOR BRANCH. *Some of the Principles and Practices of Textile Printing.* A. Howarth, Esq., A.M.C.T., F.S.D.C., A.T.I. (The Seedhill Dyeing & Printing Co., Ltd.). Technical College, George Street, **Paisley.** 7.30 p.m.

Friday, 5th December 1958

BRADFORD JUNIOR BRANCH. Diamond Jubilee Dinner Dance.

LONDON SECTION. *Dyeing of Furs.* J. L. Stoves, Esq., M.Sc., Ph.D., F.R.I.C., F.C.S. (C. W. Martin & Sons Ltd.). The Royal Society, Burlington House, **London W.1.** 6 p.m.

Tuesday, 9th December 1958

BRADFORD JUNIOR BRANCH. *The Continuous Dyeing of Synthetic Fibre Blends.* D. A. Garrett, Esq., B.A., A.Inst.P. and P. J. Dolby, Esq., B.Sc., F.C.S. Institute of Technology, **Bradford.** 7.15 p.m.

NORTHERN IRELAND SECTION. *Dyeing Unions Containing Acrylic Fibres.* B. Kramrisch, Esq., F.R.I.C., F.T.I., F.S.D.C. (Ciba Clayton Ltd.). Grosvenor Rooms, **Belfast.** 7.30 p.m.

SCOTTISH SECTION. *Fast Shades on Wool-Cellulose Unions.* D. R. Lemin, Esq., B.Sc. (Imperial Chemical Industries Ltd.). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

Wednesday, 10th December 1958

MIDLANDS SECTION. *The Setting, Dyeing and Finishing of Banlon Knitted Goods.* A. L. Horobin, Esq. King's Head Hotel, **Loughborough.** 7 p.m.

Thursday, 11th December 1958

WEST RIDING SECTION. *The Development of a Dyestuff from its Synthesis to its Marketing.* K. Roessler, Esq. (Badische Anilin & Soda-Fabrik). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Tuesday, 16th December 1958

HUDDERSFIELD SECTION. *The Development of a Dyestuff from its Synthesis to its Marketing.* K. Roessler, Esq. (Badische Anilin & Soda-Fabrik A.G., Germany). (Joint meeting with the Huddersfield Section of the Royal Institute of Chemistry.) Silvios Cafe, **Huddersfield.** 7.30 p.m.

Thursday, 18th December 1958

MANCHESTER JUNIOR BRANCH. *Modern Package Dyeing.* A. Gibb, Esq. Room J/B 16—Chemical Engineering Building (Jackson Street), College of Science and Technology, **Manchester.** 4.30 p.m.

Friday, 19th December 1958

MANCHESTER SECTION. *Felisol— An International Guarantee of Colour Fastness.* K. McLaren, Esq., B.Sc., F.R.I.C., F.S.D.C. (Imperial Chemical Industries Ltd.). The Textile Institute, 10 Blackfriars Street, **Manchester.** 7 p.m.

Tuesday, 6th January 1959

LONDON SECTION. *To Blend or not to Blend—That is the Question.* Professor J. B. Speakman, D.Sc., F.R.I.C., F.T.I. (Leeds University). (Joint meeting with the London Section of the Textile Institute.) Chemical Society, Burlington House, **London W.1.** 6.30 p.m.

Thursday, 8th January 1959

WEST RIDING SECTION. *New Levelling Agents in Acid and Direct Dyebaths.* G. H. Lister, Esq., B.Sc., Ph.D. (Sandoz Products Ltd.). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Friday, 9th January 1959

LONDON SECTION. *Optical Brightening Agents in Action.* J. L. Ashworth, Esq., B.Sc., Ph.D., H. B. Mann, Esq., T. H. Morton, Esq., M.Sc., Ph.D., F.S.D.C., F.T.I. (Courtaulds Ltd., Textile Research Laboratory, Bocking.) The Royal Society, Burlington House, **London, W.1.** 6 p.m.

Tuesday, 13th January 1959

NORTHERN IRELAND SECTION. *Some Observations in the Uses of Synthetic Resin Products and Chemical Reactants to Cellulosic Materials.* F. Sloan, Esq., M.Sc. (Kirkpatrick Bros. Ltd.). Grosvenor Rooms, **Belfast.** 7.30 p.m.

SCOTTISH SECTION. *Dyeing Unions Containing Acrylic Fibres.* B. Kramrisch, Esq., F.R.I.C., F.T.I., F.S.D.C. (Ciba Clayton Ltd.). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

Thursday, 15th January 1959

MANCHESTER JUNIOR BRANCH. *Management.* Prof. R. W. Revans. Room J/B 16—Chemical Engineering Building (Jackson Street), College of Science and Technology, **Manchester.** 4.30 p.m.

Friday, 16th January 1959

MANCHESTER SECTION. *The Degradation of Chemically Modified Celluloses by Alkali.* Dr. W. M. Corbett (British Rayon Research Association). The Textile Institute, 10 Blackfriars Street, **Manchester.** 7 p.m.

Monday, 19th January 1959

HUDDERSFIELD SECTION. Title to be announced later. Professor J. B. Speakman, D.Sc., F.R.I.C., F.T.I., F.S.D.C. (Joint meeting with the Huddersfield Textile Society.) Large Hall, Technical College, **Huddersfield.** 7.30 p.m.

Tuesday, 20th January 1959

SCOTTISH JUNIOR BRANCH. *Variables in the Cold Batchwise Dyeing of Reactive Dyes.* I. H. Burnett, Esq., B.Sc. (Imperial Chemical Industries Ltd.). The Loch Lomond Hotel, **Balloch.** 7.30 p.m.

Wednesday, 21st January 1959

MIDLANDS SECTION. *The Solubility of Wool Dyes ... Assessment and Practical Significance.* W. Beal, Esq., B.Sc. College of Technology, **Leicester.** 7 p.m.

Thursday, 22nd January 1959

WEST RIDING SECTION. *Some Aspects of Reactive Dyes.* Dr. J. Wegmann. (Ciba Ltd., Basle). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Friday, 23rd January 1959

LONDON SECTION. Annual Dinner and Dance. Waldorf Hotel, **London, W.C.2.** 7 p.m. for 7.30 p.m.

WEST RIDING SECTION. Ladies Evening. Victoria Hotel, Bridge Street, **Bradford.**

Monday, 26th January 1959

BRADFORD JUNIOR BRANCH. *Recent Developments in the use of Terylene Staple Fibre in the Woollen and Worsted Industry.* P. W. Eggleston, Esq. (Imperial Chemical Industries Ltd.). Institute of Technology, **Bradford** 7.15 p.m.

Saturday, 31st January 1959

MANCHESTER SECTION. Annual Dinner and Dance, Grand Hotel, **Manchester.** 6 p.m. for 6.30 p.m.

Tuesday, 3rd February 1959

LEEDS JUNIOR BRANCH. *Colour Matching.* E. Bellhouse, Esq., B.Sc. Lecture Theatre, Department of Colour Chemistry and Dyeing, The University, **Leeds.** 3.15 p.m.

Thursday, 5th February 1959

MIDLANDS SECTION. *Developments in Modern Dry-cleaning Techniques.* E. J. Davies, Esq., M.Sc. Gas Board Theatre, **Nottingham.** 7 p.m.

Friday, 6th February 1959

LONDON SECTION. *Colour Photography.* Dr. R. W. G. Hunt (Kodak Ltd.). The Royal Society, Burlington House, **London W.1.** 6 p.m.

Tuesday, 10th February 1959

BRADFORD JUNIOR BRANCH. *New Levelling Agents in Acid and Direct Dyebaths.* G. H. Lister, Esq., B.Sc., Ph.D. (Sandoz Products Ltd.). Institute of Technology, **Bradford.** 7.15 p.m.

continued on page xxxiii



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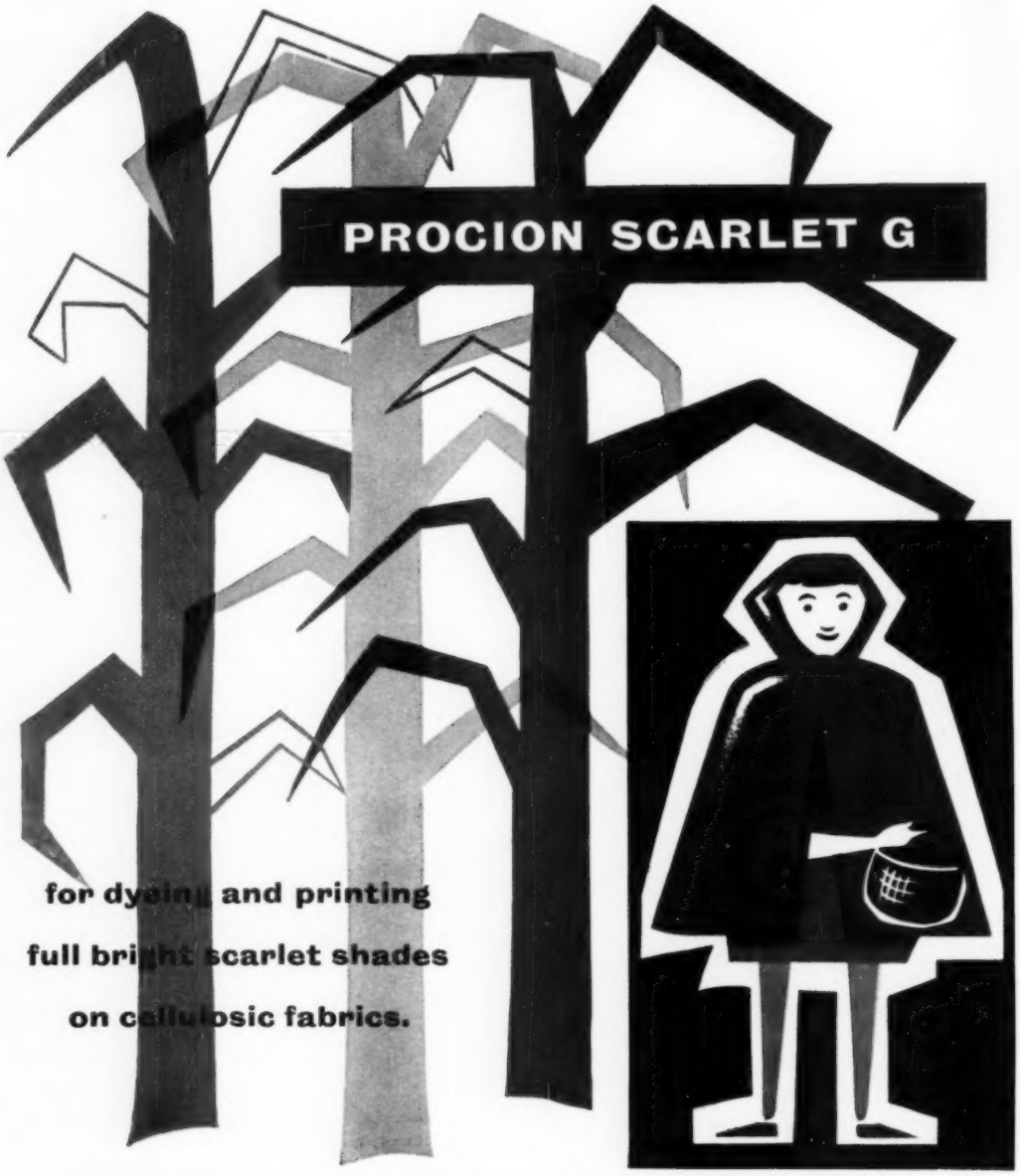
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THE JOURNAL
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Volume 74 Number 11 NOVEMBER 1958 Issued Monthly

Proceedings of the Society

Education in a Changing Society

G. S. J. White

Meeting of the Summer School in Dyeing held at the University, Nottingham, on 30th August 1958, Mr. A. W. Carpenter in the chair

The discussion falls into two parts. The first is designed to show the progression of the Society's interest and involvement in education. The second displays some recent comparisons of educational processes, particularly in science and technology, in the U.S.S.R., U.K., and U.S.A.

Ἀρχὰ πολιτείας ἁπάσης νέων τροφά

"The foundation of every state is the education of its youth." A saying of Diogenes, quoted by Stobaeus.

Education is of itself a subject on which all mankind may claim to be expert, and the rest of the title by its very ambiguity makes it possible to interpret "the Changing Society" as our own Society of Dyers and Colourists, or as the changing society in which we live and work. Let us deal with these two aspects seriatim, and first consider what contributions the changing Society of Dyers and Colourists has made in the field of education. It could be stated that the essential and original purpose of the Society was to educate, although this was confined to a narrow field of industry and to a small band of technical folk. Its early history is interwoven with those of the local educational establishments, but up to the onset of the Second World War the Society's most obvious contribution to education was expressed in its technical meetings and publications. The strength of its educative purpose was to be found in its close association with Leeds University, Manchester College of Technology, and the Technical Colleges at Bradford and Huddersfield; and later, as the Society extended to other parts of the United Kingdom, with Loughborough, Leicester, Nottingham, Glasgow, Imperial College, London, and Queen's University, Belfast. The association was of mutual benefit, as the skills of the members as practitioners, both in the use of dyes and pigments and in their manufacture, strengthened and made more effective those pertinent theoretical courses current at these centres of higher education.

In the decade before the Second World War there arose within the Society a movement in favour of a more active participation in the education of technologists. This movement was maintained in being but was ineffective during the war, and only blossomed later, when the Society's Council constituted a Diplomas Committee, whose duty it was to examine the need to establish another technological qualification covering the special requirements of those who practise the tinctorial and allied arts, and having so established it, to devise an effective method of providing the necessary examination for the qualifications. The detailed scheme, which is now well known, was finally launched as a fully fledged venture on 14th April 1954, when a list of the first Fellows appointed by the Society was published. The Associateship examination was first held in November 1954, and since then has made the following numbers of awards—

1955	...	14
1956	...	16
1957	...	19
1958	...	15

Much individual hard work has gone into the definition of the syllabuses for the different sections of the examination, and effort continues the better to meet the need of acquainting the eminently practical technical man with the scientific background of his subject. A critical enquiry is being made into what range of text-books, both in quality and variety, are available to serve the students, and plans are actively in hand to fill in the gaps by the preparation of special books for students taking the A.S.D.C. course. Thus one adventure in education begets another.

THE PRESTIGE OF THE SOCIETY

The success of this Associateship and Fellowship scheme in technological education depends to quite a substantial extent on the prestige and esteem in which the Society is held. In this respect it is

veritably "a changing Society". In its earlier days it was necessarily somewhat local in its influence, being well and publicly known only in the West Riding of Yorkshire and among the textile-finishing industries of Lancashire and Cheshire. Today it has a world-wide influence in its own sphere of technology, but, in addition, there is an increasing attention to the effectiveness of its work, and to its bustling and urgent growth, by sister scientific societies, among which one may mention the Society of Chemical Industry, the Textile Institute, the Oil and Colour Chemists' Association, and the Society of Leather Trades' Chemists. In analysing its prestige there is no doubt that it stems greatly from the value of the *Journal*, and herein it is the quality of the *scientific* papers that gains the respect and notice of other scientists and technologists. A number of other recent activities have served to bring the Society before the notice of other peoples. Its membership of the International Federation of Associations of Textile Chemists and Colourists has been welcomed by all the Continental societies of chemists and colourists. In the narrow field of colour fastness testing, the Society, working through the British Standards Institution, is heard with authority at the meetings of the International Standards Organisation. Furthermore, many will know with what eagerness sister societies in the Commonwealth have sought some practical method of association with the parent Society. These, then, are some of the reasons why the Society's influence and prestige are extending outside its own field of technology to a broader front in which general education is an important facet.

A direct contribution to education arises out of the Perkin Centenary Celebration and comes from the Perkin Centenary Fund. This Fund was created by subscriptions from industry and is administered by a Trust empowered to assist in the further education of young men and women in special circumstances, and particularly those associated with the dyemaking and dye- and colour-using industries. The working of this Fund has been effective for only two years, but already it has enabled four men and one woman from industry to continue their education for a first degree as full-time students after laying the foundations by night-school work— two at Queen's University, and one each at Bradford Institute of Technology, Manchester University, and Loughborough College of Technology. Two men have resumed research work at universities after a period in industry: one of them has completed the tenure of a Fellowship at Manchester College of Science and Technology, and the other is about to take up a Fellowship at Leeds University. In passing, it may not be generally appreciated that it is difficult for a man in industry to qualify for the post-graduate research fellowships normally offered at universities, as it is necessary for the professor in whose department the research work is to be carried out to make a recommendation to the senate committee of the university. In the case of those who are working in industry, this is hardly possible. The work of the Perkin Trust in assisting young men who have sampled industrial research activity and who wish to return permanently to an academic life seems to be unusual and is a very proper and valuable use of the Fund. Once the young man has re-established his academic reputation, he can proceed to further research work through the various fellowship schemes, or he can put his foot on the academic ladder at the level of Assistant Lecturer with a view to obtaining a permanent academic post. In addition to these very valuable benefits, the Perkin Fund has recently enabled an exchange lectureship to be promoted between Professor A. J. Birch of the University of Manchester and Professor V. Prelog of the Federal Polytechnic in Zürich.

SUMMER SCHOOLS

Summer Schools, too, are part of the adult educational pattern. The practice of having such events has become increasingly popular and has been revived and strengthened very much since the war, not only among technologists but also among economists and administrators. The Society's first Summer School, resulting from a suggestion made by the Midlands Section, was held in 1948, and had as its basis a specifically technological course on *Dyeing and Printing*, organised at the Manchester College of Technology. The success of this venture led to a very similar event two years later at Leeds University, the subject being the *Theory and Practice of Dyeing*.

The Midlands Section and Mr. A. W. Carpenter, to whom Summer Schools have always been especially attractive, organised a successful school on *Background to the Industry* at Loughborough in August 1952. Since then there has been a gap, but the event of this week has shown how much a well organised Summer School can appeal to the practitioners of our technologies. The very fact that so many men associated with our industry have felt the need to spend this week informing each other among other things of new techniques of application, of analysis and testing, and of developments in the underlying theories of colour, shows how, individually, they support the need for continuity of education even into the middle years of their lives. However, it is not the purpose of this peroration to discuss the success or otherwise of any part of this week's work or to emphasise the advantages which have been enjoyed in the adventure. This closing address, I hope, partakes of the purpose of the Summer School and is an integral part of it.

Two previous Summer Schools have called forth general commentaries, the first by Mr. H. A. Turner, the second by the late Mr. F. L. Goodall. Both have been published in our *Journal*[1, 2] and in their re-reading evoke something of the spirit of the two occasions. However, there is one point of controversy in the second paper, wherein is quoted a view, attributed to Sir Henry Tizard and Dr. Meier, that Britain has paid too much attention to fundamental research and too little to development. The statement of these eminent men has been repeated by many lesser individuals in many contexts, and the very weight of this repetition may

have given it undue and specious currency. Personally, I find this theme hard to sustain. Looking back to the nineteenth century, which displays our vigorous and ebullient progress in research, in development, and in mechanisation and production, not only in Britain, but by Britons in many other parts of the world, we see the first pattern of industrialisation, which has since occurred in the United States and in Western Europe, and is now occurring in Russia, China, and India. The first decade of the twentieth century found Britain with enormous investments abroad as a result of its research and its industrial development. These investments returned to the United Kingdom in the shape of goods and services which made the people of this country, and particularly their leaders, less clear as to how wealth is created; and less clear as to the continuing need to foster technology and scientific study in early education. Two world wars have stripped us of these foreign investments, and once again it is made apparent to all that the future standard of living of the people in the United Kingdom and our future status and influence are entirely dependent on our technological success in the development of new products and processes in what is now a highly competitive world industrial scene. Within our own physical capacity it is not demonstrably true that we are less able to develop than to research. Jewkes, Sawers, and Stillerman [3] say—

> We can find no convincing evidence to support the present popular view that the British are 'good at' invention but 'bad at' development. Indeed, in other countries, the opposite is often believed.

They precede this with—

> The British suffer from the delusion that they are, and always have been, a highly inventive people, whose ideas are frequently stolen by other nations. This certainly has not always been the case.

It may not be any further ability to develop our inventions that needs to be invoked but rather the long-term need to have more education leading to more basic training in research, and thus more inventive potential. Development of our inventions can be regulated by economic pressure. In fine, we may say: "Necessity is the mother of development".

COMPARATIVE EDUCATION—U.K., U.S.A., U.S.S.R.

We do not need to stress that the chances of success of our technologists must largely derive from the basic suitability and quality of the education that is provided. It was Pope in his *Moral Essays* who said—

> 'Tis education forms the common mind,
> Just as the twig is bent, the tree's inclined.

Many another, including eminent divines, have said as much and in numberless different ways; perhaps Pavlov and his dogs come into this picture as well.

Today two great countries of the world stand in opposition. In no place is this opposition so clearly exposed as in the field of education. The traditional approach in the United States is for each community to be responsible for providing schools, engaging teachers, establishing their curricula; and then, as an individual part of the state within which the communities find themselves, to be responsible for establishing universities and technical colleges. There tends to be in the U.S.A. a very wide spectrum of university education, ranging from that patterned on Europe, and found on the Eastern seaboard and more particularly in the New England states, to the newly established universities of the West and the mountain states, which are less touched by the classical tradition. Underlying the school and university system of the U.S.A. is the psychological approach of parents to children, perhaps something left over from the hard pioneering days of the nineteenth century. Then material success meant a better time for children and a freedom from parental domination and direction, thus helping them to break away from the European tradition. This, in the broad, has led to an easier approach to learning and to a multiplicity of specialisations which tend to fit the desires of the individual rather than the basic needs of the developing industrial society; to too little direction to the needs of the community, too little appreciation of the necessity to get the academic best from everyone.

The high-school leavers, aged 18, tend to be less well taught than our own grammar-school leavers, particularly in mathematics, and in effect the junior college to which school leavers may go for two years from 18 to 20 is designed to cover this deficiency. Although the first university degree—B.S. or some equivalent—is in general inferior to the British B.Sc., the higher degree of Ph.D. is certainly equivalent to a British Ph.D. and to a Candidateship on the Continent.

In the U.S.S.R., on the other hand, everything, including education, is organised to serve the long-term Communist Party programme for the industrialisation of the country. In this last part of my address I propose, therefore, to touch on one or two sources of information about education in the U.S.S.R., comparing it where possible with our own practice, or that of the United States. To those who have little time to spare, I would commend the chapter on education from John Gunther's book *Inside Russia Today* [4]. The section from this highly informative and objective work is headed "New Worlds in Science and Education". Therein the author observes the tremendous progress in the building of schools in Moscow and he visits one example at School No. 151. He also comments most favourably on the apparatus and equipment provided at the Lomonosov State University, and later in the chapter describes and compares student life with that abroad. He goes on to itemise some generalities about education within the U.S.S.R., and finishes with a description of the all-powerful centre of direction of Soviet scientific education at the Academy of Sciences. Three points are emphasised by Gunther. Firstly, he was informed that all the schools are modelled on the same pattern over the whole country, in their curricula, in their books, and in their teaching techniques. Secondly, illiteracy is claimed to have been eradicated: he quotes as an example the state of Uzbekistan, in which only 2% of the populace could read and write 40 years ago, but which now

has 81 college graduates per 10,000 of the people, and this proportion is said to be seven times as great as in Turkey and twice as great as in France. Thirdly, Gunther emphasises, as do all other writers who have had access to the Soviet educational system, the close link in the direction of education, and particularly of scientific education, between the Government and the Party. Two of these three things would seem to be good in any context, but the last less good, perhaps bad.

For those of us who are closely associated with Manchester, an Introduction written by Dr. B. V. Bowden, Principal of the College, to a booklet on the development of the College [5] will also be found to be illuminated by comparisons between education in the U.S.S.R., in the U.K., and in the U.S.A., and from this Introduction I have taken Table I.

TABLE I

Numbers of First Degrees awarded in Pure Science and in Technology in 1954 [5]

Country	Number per Million Population	
	Pure Science	Technology
U.S.S.R.	56	280
U.S.A.	144	137
West Germany ...	67	86
France	41	70
U.K.	105	57
Italy	51	45
Switzerland ...	44	82

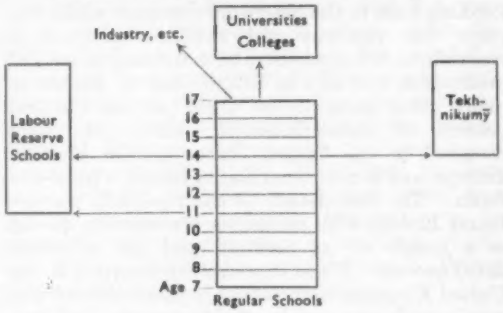
Should these two sources whet the appetite sufficiently, or if there were an intrinsic and overwhelming inclination to find out more about education in Soviet Russia, I would commend a recent work by Professor A. G. Korol entitled *Soviet Education for Science and Technology* [6]. It is from this work that I have taken some of the succeeding information in the hope that it may be of general interest.

Elementary education in the U.S.S.R. starts at the age of 7, and has three stages at 11, 14, and 17 years. In rural localities some of the children are transferred to labour reserve schools at 11, and later on the 12-, 13-, and 14-year-old leavers provide an added labour reserve school force. The greatest expansion in any section of the educational facilities is the provision of the *tekhnikumȳ*, which are not unlike an extension of our secondary school facility, terminating not at 15 but at 17 years or over, and with a much greater emphasis on engineering practice. These tekhnikumȳ take boys and girls from the ages of 14 to 17, and receive a large number of school-leavers who cannot qualify for higher education at universities and technical institutes. The whole educational scheme is set out in the modified table taken from Korol's book, and will be seen to be not unlike our own educational practice (Table II).

There is nothing intrinsic to this system to indicate that the U.S.S.R. has devised anything exceptional or novel *qua* system. The quality of what goes on within the system is more significant, and it is here that Professor Korol is most informative. One feature of value in his book seems to be the detailed attention he gives to the syllabuses and to the examinations that qualify the child for its successive moves on the educational scale, enabling

TABLE II

The Education System in the U.S.S.R. [6]



interested folk to make direct comparisons with our own standards and practices.

In the first seven years of schooling, more than one-third of the children's activity is devoted to the study of the Russian language and its literature, and nearly a quarter to mathematics. For those who go to the ten-year schools, finishing at the age of 17, the figures are 29% and 20% respectively. This would seem to show that serious attention is devoted in Russia to the "three Rs"; more, possibly, than is fashionable in *our* schools today.

To get from the ten-year school to a university or college the student must qualify for a "certificate of maturity". A scale of assessment has been fixed ranging from 1 to 5, with 1 very poor and 5 very good, the pass mark being 3. Professor Korol, who specialises in physics in the U.S.A., states that only 2% of the American "high-school leavers" (18-year-olds) are at the level necessary to take the 17-year-old tests in physics of the U.S.S.R., and later on he says—

> All Soviet ten-year school graduates, whatever their average achievement, are exposed to and study topics in mathematics and science up to a level reached by very few American young men and women with high school education.

In Britain, and particularly since the war, we have been worried about the lack of growth in the numbers of students of science at grammar schools and high schools. It is therefore a little more cheerful to look at the following figures, vouched for by Mr. A. A. Part, Under Secretary to the Ministry of Education, who exposed the "swing to science" at the recent Windsor conference (Table III) [7].

In the U.S.S.R. the institutions of higher learning number 729, of which 34 rank as universities. In these latter, chemistry is offered at 27, physics and mathematics at 25, history at only 16, and law at 14. The courses offered at 25 polytechnic institutes were critically examined by Korol, and in total, 167 different technological and scientific specialities were offered, only one of which concerned textiles. This very great difference in the importance attached to textile technology in Russia may be a local phenomenon in time, as we know that little special attention was being given up to 1957 to consumer goods, among which clothing and furnishings must be numbered.

The courses at universities and colleges take 2 years for teachers, 6 for medical doctors, and 4–5

TABLE III

The Swing to Science— G.C.E. Passes 1951 and 1956 [7]

	Ordinary Level			Advanced Level		
	1951	1956	Increase (%)	1951	1956	Increase (%)
Mathematics ...	45,913	70,486	54	7,986	12,338	55
Physics ...	12,169	22,868	88	9,754	14,382	47
Chemistry ...	11,815	21,403	81	8,944	11,964	34

years for others. Of the resident schools and universities, 55% of the graduates are women, and among these 80% of all the teaching graduates are women. At the university, in addition to the main subject, all the courses include physical education, a foreign language, and a subject euphemistically called "social science", which is essentially the tenets of Marxism–Leninism. The general view is that this last subject is learnt by rote, but it must not be dismissed as unimportant, since an allocation of time varying from 7 to 13% of the student's total time is devoted to it.

The whole working of the university system is under Communist Party direction, and is designed to provide the current and future needs as foreseen by the industrial planning boards. Korol states that the present stress is on providing teachers, especially of physics, so that 60% of all graduates in physics, chemistry, and mathematics are directed back to teaching. It is interesting to compare this practice with that exposed in Dr. Bowden's Introduction [6], on p. 17 of which there is given a comparison of the numbers and ages of arts and science graduates teaching in 66 grammar schools (Table IV) [8].

TABLE IV

Numbers of Arts Graduates and Science Graduates teaching in Grammar Schools [8]

(66 grammar schools in the North-west of England in 1954)

Age	Graduates (1st and 2nd class Honours)		Arts/Science (%)
	Arts	Science	
>54	117	82	70
44–54	180	145	77
34–44	256	151	60
<34	333	160	48

It was my good fortune some three years ago to listen to a most interesting address from the Dean of Harvard University, who was talking about the educational system in the United States. He mentioned that a state authority had advertised for applicants to fill 200 vacancies in the state schools for physics teachers: they had had only seven applicants, and none of the seven had the minimum qualification. Dr. Bowden also points out that each girls' grammar school in England is now able (on average) to recruit one good honours graduate physics mistress once every 100 years.

Were the material reward for being a teacher or professor in Russia only similar to that in the U.S.A. or Britain, the edict to return to teaching might press hard on university graduates, but domination by the Party machine makes it possible to establish teachers' salaries at a comparatively high level in the community. Table V compares teaching rewards with those of other workers [6].

TABLE V

Comparison of Salaries [6]

	U.S.S.R. (roubles)	U.S.A. ($)	U.K. (£)
Labourer	*A*	*B*	*C*
Lorry driver	2*A*	1·4*B*	1·3*C*
Secondary school teacher	4*A*	1·7*B*	1·3–2·2*C*
Professor	16*A**	2·5*B*	5·0*C*

* The need for such a high figure for professors is now being questioned

Educationists may also be interested in the pupil : teacher ratio, which for 1956 is given as—

Russia	22 : 1 (urban districts)
England and Wales ...	30 : 1
France	45 : 1
Sweden	22 : 1

These, then, are some of the facts of the Russian educational system, but, in addition to the good and specific intentions, there are certain weaknesses. First, there is a large reject from the school-leavers who aspire to university training: it seems that in the present circumstances there are at least two chances to one that a 17-year-old will not succeed in getting higher education and that the best that can happen to these rejects is that they will get practical experience at a tekhnikum. A second and hidden disadvantage, perhaps due to the exigencies of the system, is that students who get to the university can easily be persuaded to change from chemistry to physics or to mathematics, according to the vacancies which Party requirements establish in the different courses. Thirdly, the student body in certain urban centres has already shown a marked tendency to become academic and separate in its outlook. Two serious attempts have been made to alter this, neither of which can be said to be entirely successful. In the first case, the students are pressed to spend a part of their vacation in industrial mills. There have been widespread complaints that these students upset the discipline of the workers and idle their time away playing chess, sleeping, and swimming, and possibly using the remainder of their time in even more social pleasures. This attitude is partly due to the pressure under which industry works to achieve its goals in output, thus making it not very receptive to the part-time training of students. In the other case, there has been an insistence that technologists, after attaining their first degree, go into industry for two years before taking up a post-graduate course likely to lead to the equivalent to a Ph.D. This, too, has not succeeded well, since in industry trained men soon reach places of responsibility carrying high salaries, often two or three times those offered as subsistence allowances to students engaged on post-graduate work; and this proves a powerful deterrent to returning to university research.

Korol, in summarising his review of education in the U.S.S.R., emphasises these three points: Firstly, education is dominated and controlled by the self-perpetuating Communist Party. Secondly, the primary objective is to fit education to the needs of the industrial planners. Thirdly, there is a more or less complete subjugation of the individual, at least until the level of the Ph.D. student, to these planned requirements, so that most are taught rather than educated.

Perhaps I have dwelt too long and given too much detail in this comparative review of Soviet education, but in so doing I hope to stimulate members of our Society to be constructively critical of our own system. It seems to me that by far the most important feature of the Russian educational scene is the ploughing back of scientific graduates into teaching at the rate of 60% per annum, and the full material support of this action by regulating upwards the teachers' salary scale.

However, let us take courage from what educational progress is being made in the U.S.S.R., for Lord Brougham said—

> Education makes people easy to lead but difficult to drive, easy to govern but impossible to enslave.

and much the same was written for Everyman by Mark Twain, when he said—

> Soap and education are not as sudden as a massacre but they are more deadly in the long run.

These philosophers give us cause for great hope as more young questioning minds are fashioned by the Soviet educational system. Moreover, there are no indications that their system produces a greater proportion of better educated men and women than does our own: in fact, their only present advantage may be in the ploughing-back process, which could enable them to outstrip us in numbers of trained physicists, mathematicians, and chemists later in this century if we do not take heed now.

It is therefore imperative for us to continue to concern ourselves with education, and particularly with those schools and colleges of science and technology that operate in our own locality. This can be done partly as a service outside our normal working hours, but it must also be a permanent item for the attention of all executives in industry. It is not enough to give complacent approval of the part-time release of employees, or of "sandwich courses". A continuous appreciation of the whole fabric and structure of education and its rewards as a career must be the duty of all industrial leaders, and of all trade union and professional bodies, among which we number our Society of Dyers and Colourists. Only by well organised attention to the dynamic problems involved will we in Britain be able to preserve an educational and intellectual parity with Russia and so make sure that our children will have a proper contribution to make to the world of the twenty-first century.

* * *

My thanks are due to the publishers of the books indicated in the list of references below for permission to reproduce the various tables in the paper.

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Colour in Writing and Copying

J. P. GILL

Meeting of the London Section held in the rooms of the Royal Society, Burlington House, London, on 6th December 1957, Dr. T. H. Morton in the chair

A general summary of types of dyes and pigments used in inks (other than printing inks), pencils, typewriter ribbons, and carbon papers. An account of the properties necessary for the different applications is given, together with some particulars of the method of manufacture and use of typewriter ribbons and carbon papers, both for normal typing purposes and for spirit duplicating.

INTRODUCTION

This paper will cover the inks used in writing and copying by hand or by machine, such as the typewriter and other items of equipment commonly met in the modern office, use of which can be regarded as an extension to hand writing. Printing inks of all types are specifically excluded from consideration. Even so, we are left with a wide variety of inks employed in different ways, and whilst originally ink was a fluid which could be used to make, with some form of pen, a mark on paper or other material, it can now be extended to the oily and waxy materials in typewriter ribbons and carbon papers. We shall start our consideration of materials used in writing and copying with the oldest type of ink, the writing ink.

WRITING INKS

The history of writing inks is a long one, and archaeological evidence indicates that writing inks were used by the Egyptians over 5,000 years ago. These inks were probably made by dispersing lampblack or some other form of Carbon Black (C.I. Pigment Black 7) in water and applying the ink so formed with a reed or a stylus. It is worth noting that Carbon Black is still one of the most important colouring matters used in the manufacture of different types of ink, and Carbon Black dispersions of this type are still used today in the less sophisticated areas of the Middle East. Inks of a similar type were used also by the Chinese in early times; a Carbon Black dispersion with shellac is still used under the name *Chinese ink*; *Indian ink*, which is widely used for drawing, is very similar. There are indications that during Roman times inks of colours other than black were made with natural pigments, mainly of the earth type.

At a much later date, somewhere about the ninth century A.D., inks depending on the formation of black iron tannate came into use. This iron tannate ink differed considerably from the blue–black writing inks we know today, since the iron tannate was fully oxidised during production of the ink, and writing was in fact carried out with a sus-suspension of black iron tannate. In application, therefore, inks continued to be more or less fine dispersions of coloured pigments. The first step forward towards the clear, sediment-free inks of today did not come until about 1800, when non-oxidised iron tannate inks first made their appearance. A fuller account of the history of writing inks is given by Mitchell[1], from which source much of this information has been obtained.

A modern writing ink must be a clear, sediment-free liquid; this is, of course, essential with the development of the fountain pen, and for the same reason control of viscosity to give correct flow properties in the pen is essential. The modern iron tannate and iron gallate inks, otherwise known as *blue–black ink*, *legal ink*, etc., differ considerably from the dispersion used until about 150 years ago. They are solutions containing ferrous sulphate and tannic or gallic acid (frequently both) together with a small quantity of a mineral acid and a suitable soluble dye. The permanent black colour is due to formation of an insoluble iron tannate or gallate, which develops under the oxidising influence of the air. Since this takes place only over a period of several days after writing, the initial mark is due to the soluble dye. Owing to their considerable degree of permanence, inks of this type are frequently considered essential for legal documents, and in some countries there are in fact rigid specifications concerning their composition for legal and record purposes. The sighting colour is very important, since writing with an ink not containing dye is virtually illegible until the black iron tannate is formed. Selection of dyes for inks of this type presents several problems, since dyes stable in the presence of a mixture of tannic acid, ferrous sulphate, and mineral acids are very few. By far the most widely used is the Ink Blue AS (C.I. Acid Blue 27) type, which has been developed specially for this purpose; a few other dyes have some degree of stability in iron tannate inks, e.g.—

Chlorazol Sky Blue FF 200
(C.I. Direct Blue 1)
Lissamine Fast Yellow 2G 125
(C.I. Acid Yellow 17)
Carmoisine W
(C.I. Acid Red 14)
Naphthalene Black 12B 200
(C.I. Acid Black 1)

and may be used for special purposes.

A typical formulation for an iron gall or iron tannate ink would be—

300 parts	26% Solution of tannic acid (or extract of powdered galls)
20 parts	Ferrous sulphate
20 parts	Gum arabic
9 parts	Sulphuric acid (98%)
9 parts	Phenol
1,800 parts	Water
4 parts	Ink Blue AS

The essential parts of the formulation are, of course, the tannic acid, the ferrous sulphate, and

the sulphuric acid (the function of the sulphuric acid is to prevent premature reaction between the ferrous sulphate and the tannic acid). Galls are still used as a convenient source of suitable tannins. Gum arabic is added to control the viscosity, and possibly also it assists in suspending any pigmented iron tannate which may be formed; phenol functions as a fungicide to prevent mould growth. For high-quality inks, the ink will be prepared without addition of dye and allowed to stand for several months. The clear liquor is then separated, usually by decantation, from any deposit which may have formed, and the dye added as a concentrated solution. Wide variations in formulation are permissible, e.g. in the proportions of tannic acid (which may be replaced either in part or in whole by gallic acid) and ferrous sulphate; sulphuric acid may be replaced by hydrochloric acid, or for ink powders by tartaric acid, etc.

During the past seventy years there have been more developments in writing inks than in all the earlier centuries; this is attributable to the development of synthetic dyes. Normal coloured writing inks are solutions of selected acid dyes, usually containing a fungicide such as phenol, and some gum arabic or sodium alginate to adjust the viscosity and restrict the tendency to "feathering". Dyes, commonly used include—

Eosine Y (C.I. Acid Red 87)
Ink Blue AS (C.I. Acid Blue 27)
Disulphine Blue VN (C.I. Acid Blue 1)
Naphthalene Ink Scarlet 4R 125 (C.I. Acid Red 18)
Lissamine Green V (C.I. Acid Green 16)
Lissamine Green SF (C.I. Acid Green 5)

Basic dyes were formerly used for some writing inks, but are now obsolete for this purpose. These inks give bright colours but suffer from lack of permanence, being readily removed from paper by water and faded by light. A greater degree of permanence can be produced with selected direct dyes (an important criterion is their solubility in water), which have affinity for the cellulose of paper. Examples of suitable dyes are—

Chlorazol Viscose Black B (C.I. Direct Black 19)
Durazol Paper Blue 10G (C.I. Direct Blue 87)
Durazol Red 2B (C.I. Direct Red 81)

Although not offering any considerable advantage in light fastness (apart from Durazol Paper Blue 10G), these dyes do show a considerable improvement in water resistance compared with acid dyes. Particularly high light fastness and water resistance can also be achieved with dispersed pigments, thus returning to the original type of writing ink, though no doubt the degree of dispersion achieved today is a considerable improvement over that obtainable in the past. Such pigments as the Monolite and Monastral V Pastes, e.g. Monastral Fast Blue BVS Paste (C.I.Pigment Blue 15), are aqueous pigment pastes, which for practical purposes behave as aqueous solutions when diluted with water. Unfortunately, although inks prepared with these pigment pastes can be used satisfactorily in many types of fountain pen, they can sometimes give difficulty by blocking the pen, and are, therefore, usually restricted to special pens or for special purposes.

Other modern developments in writing inks include the "quick-dry" inks. The quick drying effect is due to the presence of caustic soda, which promotes rapid penetration of the ink into the paper[2,3]. Various other additions are made to prevent feathering and other undesirable effects. An essential feature of such inks is, of course, that the dye used must have good stability to caustic alkali. By using dyes with affinity for cellulose, a high degree of permanence is obtained.

All the inks described so far are intended primarily for writing on paper. From time to time it is, of course, necessary to write on other materials, or where special properties are required on paper, e.g. in the preparation of illuminated manuscripts. Pigmented inks are of particular value for this latter purpose, as they give a richer black than can be obtained with soluble dyes. White inks are required for writing on black paper, and these are usually dispersions of titanium dioxide in water together with a suitable binder such as gum arabic. For writing on viscose films, solutions of basic dyes in water containing dextrin can be used. Laundry marking inks for textile purposes cover a wide range of types, including development of Aniline Black (C.I. Oxidation Base 1) on the textile material, silver nitrate to give a deposit of metallic silver, coloured laundry marking inks made with pigment dispersions (selected V brand pigments as mentioned above) together with a suitable synthetic-resin dispersion as binder, e.g. Bedacryl L (ICI), and inks containing substantive colourless fluorescent brightening agents[4].

Stamp-pad inks are widely used for a variety of purposes such as date stamping, marking standard instructions, etc. These must be non-drying inks, and usually consist of basic dyes in an aqueous solution containing a fairly high concentration of glycerol. The commonest is, of course, the violet ink containing Methyl Violet 2B (C.I. Basic Violet 1).

Pencils are still widely used as writing instruments. A common pencil does not, of course, use any colouring matter in the normally accepted sense of the word, the marking material being graphite. Coloured pencils are, however, made using various pigments, e.g.—

Monolite Red RMTS (C.I. Pigment Red 51)
Monastral Fast Blue BS (C.I. Pigment Blue 15)

The pigments are ground with talc and a binder such as gum arabic or sodium carboxymethylcellulose to give a stiff dough, which is extruded to form a pencil "slip" or lead, and after drying can be mounted in the conventional wood case, or used in a propelling pencil. "Copying" pencils also use colouring matter, and will be considered later.

The newest type of writing instrument is the ball pen, which has developed enormously since it was first introduced some twelve years ago. As is well known, the writing tip of the ball pen is a small ball-bearing, usually about 1 mm. in diameter, fitted in a housing which permits it to rotate in any direction. Ink is fed to this ball through a capillary tube in the housing, and is metered by

the clearance between the ball and the housing to give a very thin film of ink, which is transferred to the paper as the ball rotates during writing. It is a very convenient form of writing instrument, and in its present form will give writing with good permanence which is free from marking-off difficulties, bleed in water, etc. Since the amount of ink used at any one time is extremely small, the pen can normally be used for a considerable time before the ink reservoir is empty. There are, however, many problems associated with the ink, and it is doubtful whether the ideal ball-pen ink has yet been formulated. In addition to functioning as a writing medium, the ink must serve as a lubricant between ball and housing; since the clearance between ball and housing is extremely small, the ink must be completely free from solid particles, which could cause blockages, and the viscosity and the surface tension must be such that the flow through the pen is neither so excessive that blobbing results nor so meagre that the trace will be too weak. Owing to the small amount of ink applied at one time, high concentrations of dye are necessary in the ink, and dyes of high solubility are, therefore, essential.

To meet this requirement early ball-pen inks used oil media [5], coloured with the bases of basic dyes which had been dissolved in a suitable fatty acid, usually oleic acid. (Very high concentrations not only possible but desirable.) A typical ink formulation of this type would be—

10–15 parts Waxoline Victoria Blue BNS (C.I. Solvent Blue 4)
30 parts Oleic acid
60 parts Blown castor oil

In manufacture, the dye was dissolved in the fatty acid by heating, usually with constant stirring for several hours, and the blown castor oil added, after which the ink was de-aerated, passed through some form of grinder or centrifuge to remove any solid particles, and finally filled into the pen cartridges. These inks had many disadvantages: thus the light fastness of the dye used was very low, the writing tended to mark off and could be readily transferred, and the inks themselves were dirty, so that any pen leaks could produce a considerable mess.

During the past five or six years there has been an increasing use of inks based on glycols such as propylene, hexylene, and octylene glycols [6], and at the present time almost all the inks used in North America and most of those used in this country are of this type. The dyes used are spirit-soluble dyes of special types, the most widely used being a spirit-soluble phthalocyanine derivative. Dyes of this type are—

Methasol Fast Blue 2BS (ICI)
Spirit Fast Blue MBSN (DuP)

The dyes must have very high solubility in glycols, of the order of 50%. These highly concentrated solutions show surprising behaviour. It is difficult to believe that the dyes are present in "true" or molecular solution; nevertheless, such solutions do appear to have Newtonian flow. This type of ink also presents many problems: once again the dyes must be as free as possible from any insoluble matter, though small quantities can be removed by centrifuging or related operations. The solution of dye in the glycol selected must give a correct viscosity, which should be as nearly constant as possible over a wide range of temperature (this can be controlled to some extent by using mixtures of glycols), and there must be no crystallisation or separation in the ink over long storage periods. Furthermore, there must be no corrosive action on the metal parts of the ball or ball housing. Even after all these requirements have been met, as they largely are with existing blue dyes, though to a less extent with other colours, the glycol itself introduces some difficulties. For example, it is hygroscopic, and moisture absorption at the tip can lead to precipitation of the dye, blocking the pen. It is also possible for the pen to stop writing because of moisture absorption at the top of the cartridge causing a crust of precipitated dye to form. Some manufacturers place a layer of very viscous oil above the ink, which serves to prevent this, and also reduces the tendency of the ink to flow back up the cartridge. Further, the glycols are relatively poor lubricants, and in some cases there may be excessive wear between the ball and the housing, leading to excessive ink feed after the pen has been used for some time. For these reasons, the ideal ball-pen ink has yet to be found, although undoubtedly this will come sooner or later. The widespread popularity of the ball pen at the present time is sufficient indication of the future of this type of writing instrument.

COPYING INKS AND PENCILS

In modern business life, at least one copy of any document other than the original is normally necessary, and in many cases multiple copies are required. Many years ago the provision of an extra copy of a letter which had been written in longhand would be the duty of a copy clerk, who would copy the original, also in longhand. With the advent of synthetic dyes this method could be replaced by copying inks or pencils. These inks contain a relatively high concentration (normally about 10%) of a suitable basic dye, e.g.—

Methyl Violet 2B (C.I. Basic Violet 1)
Victoria Blue B (C.I. Basic Blue 26)

The original is written with this ink, and further copies can be made by pressing dampened sheets of paper in contact with the original. This was the basis of the letter press method, the letter press being at one time a prominent feature of all general offices. The letter from which the copy was to be made was placed in contact with a special translucent paper containing a hygroscopic material such as glycerol, and the two were pressed together in the letter press. Some of the dye was transferred to the copy paper, giving a reverse image, which could, however, be read from the back of the paper owing to its translucence. Copying inks were used also for making copies on the "jelly" machine. Here a master copy was prepared by writing with the copying ink, and the master pressed in contact with a sheet of gelatin to give a reverse image by transfer of the dye.

Further sheets of paper pressed in contact with the gelatin each remove part of this dye, giving a considerable number of copies, often up to 100. The copies in many cases tend to suffer from lack of legibility, as those with some recollection of school examination papers will probably know.

Copying pencils can be used in the same way as copying inks: these are pencils made on either a graphite or a talc base and containing up to about 30% of a selected basic or acid dye. Requirements of dyes for copying pencils are very severe: in particular, they must be free from inorganic electrolytes, which can effloresce and in extreme cases split the wood case. Suitable dyes for this purpose are—

Methyl Violet PV (C.I. Basic Violet 1)
Ink Blue AS (C.I. Acid Blue 27)
Methylene Blue ZFS (C.I. Basic Blue 9)
Rhodamine B 500 (C.I. Basic Violet 10)
Eosine Y 125 (C.I. Acid Red 87)

In recent years the copying pencil has been rarely used for the preparation of multiple copies, but it is still used in some quarters because of its indelible properties, the presence of the water-soluble dye making it difficult or even impossible to remove a mark made with one of these pencils by means of the conventional pencil eraser.

TYPEWRITER RIBBONS

Numerous attempts were made during the nineteenth century to build a writing machine which would be more rapid (and in many cases more legible) than normal handwriting. The first successful writing machine or typewriter appears to have been made by Remingtons in about 1873. The development of a machine of this type meant that some means of inking had to be found. Although in very early machines a somewhat complex system involving liquid inks was used, it was presumably never very satisfactory, since in a very short time ribbon inking was introduced. A typewriter ribbon is a long length of tightly woven material approx. ½ in. wide, which has usually been obtained by splitting from a much wider cloth and sealing the edges (to prevent fraying) with a suitable lacquer, which may be glue, cellulose nitrate, or one of the newer synthetic resins. At one time silk was very widely used for typewriter ribbons, but it has been almost completely replaced by cotton. In recent years a few nylon ribbons have made their appearance. Non-drying properties are, of course, essential in a typewriter ribbon ink, otherwise it would rapidly lose its transfer properties, and early inks were solutions of acid or basic dyes in glycerol. Present-day typewriter-ribbon inks are invariably oil-based, non-drying oils being, of course, used. A typical oil mixture would be 15% arachis (ground nut) oil, 15% sperm oil, and 70% mineral oil.

The most widely used colouring matter is Carbon Black, but because of its brown undertone, which is not generally acceptable, it is shaded with blue and violet pigments or oil-soluble dyes. Coloured (as distinct from black) typewriter ribbons will normally contain pigments, though occasionally oil-soluble dyes may be used. Pigments are incorporated in the ink by grinding, usually on a three-roller mill, but there is an increasing tendency to use ball mills for this type of work, particularly in North America. Selection of the type of colouring matter to be used depends on the kind of typewriter ribbon which is being made. In the single-colour ribbon, Carbon Black will frequently be shaded with oil-soluble dyes such as—

Waxoline Induline 2BS or 5BS (C.I. Solvent Blue 7)
Waxoline Victoria Blue BNS (C.I. Solvent Blue 4)
Waxoline Violet 2BNS (C.I. Solvent Violet 8)

For a bi-colour ribbon, where it is essential to maintain a sharp line between the two colours on the ribbon, non-bleeding dyes must be used. In this case, Carbon Black would be shaded with products of the type of—

Fastel Blue B Supra Powder
(C.I. Pigment Blue 1)
Fastel Violet R Supra Powder
(C.I. Pigment Violet 3)

For coloured ribbons, Fastel pigments or azo toners or pigments are used, e.g.—

Monolite Red RMTS (C.I. Pigment Red 51)
Rubine Toner BS (C.I. Pigment Red 48)
Bronze Scarlet CS (C.I. Pigment Red 53)

A typewriter ribbon which is intended for work suitable for photocopying must contain a component which will absorb in the ultraviolet; Waxoline Orange AS (C.I. Solvent Orange 15) has been found very suitable for this purpose.

Whilst pigments are normally ground into the oil ink on a roller or ball mill, the soluble Waxoline type of dye is dissolved in oleic acid to give a concentrated solution (normally approx. 2 parts of acid to 1 of dye) and added to the oil ink in this form. In the case of a Carbon Black ink which is to be toned with soluble dyes, the oleic-acid solution would normally be added to the ink after grinding. It is desirable to have as high a concentration of colouring matter as possible, but in the case of pigments this is limited by the necessity for good flow properties in the ink. Concentrations of 10–20% are normal, and it is interesting to note that, with Carbon Black inks, the concentration of pigment which can be used is considerably increased when "oleates" of Waxoline Induline 2BS, Waxoline Violet 2BNS, or Victoria Blue BNS are also added, since these "oleates" appear to function as flow-promoting agents with Carbon Black. The ink is applied to the ribbon on a machine in which it is fed from a trough through a series of rollers to contact the ribbon. Colouring of a bi-colour ribbon is a similar process in which the same principle is used, coating being in two stages, and great care in alignment is essential.

CARBON PAPERS

The development of carbon papers owes much to the development of the typewriter. With a sheet having a transferable coating, a typewriter gives a method of making a limited number of copies in a single operation. Carbon papers are sheets of suitable tissue with a coating of coloured wax, a typical formulation being—

15 parts	Colouring matter
40 parts	Carnauba wax
10 parts	Paraffin wax
10 parts	Vaseline
25 parts	Mineral oil

Here again, the most important colouring matter is undoubtedly Carbon Black, but since bleed problems are relatively unimportant in carbon papers, it will normally be shaded with oil-soluble dyes of the Waxoline type. The type of formulation used in carbon papers depends upon the ultimate purpose for which the paper is intended: thus for typing work a relatively hard and tough coating is used to give maximum life, for pencil carbons a somewhat softer formulation is desirable, and a still softer formulation is required for a pen carbon. The majority of typewriter carbons are black, i.e. Carbon Black shaded with Waxoline-type dyes, but for pencil and pen carbons bright colours are frequently used, and here the oil-soluble dyes or even selected basic dyes, particularly Victoria Pure Lake Blue BO (C.I. Basic Blue 7), are used.

Once again the soluble dyes must be dissolved in fatty acid, or in the case of Victoria Pure Lake Blue BO in castor oil, or oleic acid, before being added to the remainder of the carbon-paper mix—solution behaviour which a dyer may not associate with a basic dye. The types of colouring matter used are essentially the same as those used in typewriter ribbons. With soluble dyes, preparation of ink is relatively simple: the dye is dissolved in the oleic acid or castor oil, and the remaining oils and waxes are added, usually vegetable or animal waxes first, followed by hydrocarbon oils and waxes. Where pigments are used, grinding is again necessary. In Europe this is usually carried out on a heated three-roll mill, but in North America heated ball-mills are almost universally used on cost grounds: much less labour is required for ball-milling than for roll-milling. There is said to be little difference, however, in the degree of grind obtained by the two methods. Pigments can be ground into a portion of the ink, and the remaining constituents then added, but it is more normal to grind the whole of the ink together.

Coating on paper is carried out hot, the molten ink being picked up by rolls and transferred to the surface of the paper. Constant thickness is maintained by a device known as an *equaliser bar*, which is a rod wound spirally with a wire, the gauge of the wire used controlling the thickness of the coating. Coatings of different compositions and thicknesses on different backing papers have varying characteristics and are produced to suit a wide variety of requirements. To prevent curling of carbon papers and also to provide a more attractive appearance on the back, coloured tissues may be used, and it is normal to apply a wax or lacquer coat to the back of the carbon paper. This serves the dual purpose of preventing curl and also preventing slipping in the typewriter, and it may be coloured to provide an attractive appearance. Many carbon papers are also printed on the back with the makers' or suppliers' brand mark or trade mark [7, 8].

COPYING RIBBONS AND HECTOGRAPH CARBON PAPERS

In the production of multiple copies, methods using the typewriter have considerable advantages over the older copying inks and pencils. As in the older processes, copying depends on the high tinctorial strength of the basic dyes in all but the most modern developments. In a copying ribbon, as high a concentration as possible (25–30%) of basic dye is ground into a conventional oil medium, and this ribbon can be used to make a master copy, from which further copies can be made by methods similar to those used with a copying ink. The copies are much clearer than those obtained by the older methods and a larger number of copies will normally be obtained. The number of copies is still, however, relatively limited.

The development of copying or hectograph carbon papers, with the side-by-side development of spirit duplicating machines, has done much to improve the status of this type of multiple copying. The conventional spirit duplicating carbon paper consists of a coating of wax and oil containing 50–60% of a suitable basic dye. Although it can be used to prepare a right master, which can be used in a similar manner to the masters prepared with copying inks or copying ribbons, by far its most important and almost inevitable application is in a spirit duplicating machine. Here, a reverse master is prepared by typing on a specially prepared master paper, the carbon paper being placed coated side uppermost behind the master paper; the master is then placed on the drum of a spirit duplicating machine, and sheets of paper which have been damped with a copying fluid, essentially ethanol, are pressed in contact with it, removing a small amount of the basic dye for each copy. In this way, under suitable conditions and with a suitable carbon paper, up to 500 or 600 copies can be prepared; or alternatively, the method lends itself very satisfactorily to various office systems where more copies are required than can conveniently be prepared by normal typing.

In manufacture, the basic dye is ground into the wax–oil medium, a typical basic medium being 30% carnauba wax plus 70% mineral oil, though this would undoubtedly be modified in practice by addition of other oils or waxes to provide the most satisfactory "cut-out" and transfer to the master paper. Complete transfer of the coating at the points struck by the type would be aimed at in normal circumstances, though some paper intended for short runs can be used more than once.

Coating is by conventional methods as used for typewriter carbons.

With a dye concentration of 50% or more, it is obvious that the dye plays an important part in the properties of the carbon-paper coating. In order to have good coating, it is essential that the coating composition should be fluid and stable at temperatures of the order of 100°C. in the coating machine for considerable periods of time. Over a period of years, basic dyes which are suitable have been selected, and have been purified to give optimum working conditions. By far the most popular dye is the Methyl Violet 10B (C.I. Basic

Violet 3) type, Methyl Violet 10BNS and 10BDS (ICI) being brands specially made for this application. For satisfactory hectograph carbon paper manufacture, a very pure dye is required with very low moisture content (excessive moisture content in a hectograph carbon paper dye can cause "tarring" in the coating composition). Various impurities can lead either to tarring, separation, or thixotropic phenomena in the composition. Unsatisfactory dyes themselves can give considerable difficulties, and with many basic dyes it is impossible to prepare a satisfactory coating composition.

The rate of removal of dye from the master (copying rate) can also be important. Particularly with the widely used violet carbons, requirements may vary from 20 good strong copies, including the first, to a run of 500 or 600 copies, where the first one or two can be relatively unimportant. The copying rate of the dye can be modified by variations in crystal structure, etc., and there are, in fact, different grades of Methyl Violet 10B available to give this. Methyl Violet 10BNS and Methyl Violet 10BDS represent, respectively, dyes giving relatively short runs of high-strength copies and long runs of relatively low-strength copies, and variations can be obtained by mixing the two dyes. The use of ball mills for grinding the coating composition can also introduce problems, since here the grinding continues for several hours at elevated temperatures, and intensifies the problem of heat stability: the dope must be stable for a long period in a molten state not only during coating, but also during milling.

The production of a black hectograph carbon is a very desirable object, but has presented difficulties. Since there is no homogeneous black basic dye, it is necessary to use mixtures of dyes to produce a black. The first and obvious difficulty here is that the rate at which the different dyes will copy is liable to vary, and it is very easy to make a black hectograph carbon where the early copies will be a dull red, eventually becoming black and ending the run as a dull green. Another difficulty is that individual dyes which will behave satisfactorily in the carbon formulation will not necessarily do so when used in mixtures. By careful selection of the dyes and attention to points such as moisture content, satisfactory black mixtures can be produced which will behave reasonably satisfactorily in the coating composition, and will copy reasonably uniformly. Examples of these are Methic Copying Black CPN and Methic Copying Black 14168 (ICI). Wet mixing of the dyes is also used to achieve more satisfactory properties— the so-called "tarred" or "puddled" blacks.

Another problem which occurs with hectograph carbons is that of cleanliness. As is well known, basic dyes leave much to be desired in this direction, and apart from the unpleasantness of handling the dye during manufacture of the carbon paper, offices using such carbons are frequently violet from top to bottom and the staff using the carbons find stains on skin, clothing, etc. Staining is due both to direct contact with the carbon paper or the master and to small particles of "carbon" flying about under the impact of typewriter key blows and subsequently settling on furniture, round the neck, etc. This problem is appreciated by the carbon-paper manufacturers, and numerous attempts have been made to overcome it. An obvious and widely used method is to apply a "top coat' or "super-coat" of uncoloured wax over the normal carbon coating; in some cases metal powder is included in the wax coat to give greater coherence and an attractive appearance. In addition to giving some advantage in cleanliness the top-coating technique improves the copying properties of the carbon paper by interposing a barrier between the master paper and the carbon coating during copying, and thus preventing loss of dye into the master paper itself. In general, there is also some increase in the clarity of the copies prepared with a top-coated carbon. This, however, is only a partial answer to the cleanliness problem, since it does not eliminate either the dirtiness of the master itself or the tendency of particles of coating to fly about.

More recent attempts to make clean carbons have tackled the matter in a more fundamental manner by eliminating the basic dye itself. Some methods of this type are already on the market, the earliest being the Azograph process introduced by the A. B. Dick Co. of the U.S.A.[9], in which the carbon paper contains a stabilised diazo compound and a coupling component which react only in contact with the copying fluid, which contains alkali. This process is undoubtedly clean, but has the disadvantage of requiring an alkaline fluid, and hence a special spirit duplicating machine (corrosion problems arise in the conventional machine). The use of stabilised leuco compounds of basic dyes has been suggested by du Pont[10], though as far as is known no commercial carbon paper of this type has as yet made its appearance. Another technique is the Methasol Copying Blue BS (ICI) method[11], in which a spirit-soluble mordant dye is used. This dye is a reddish-brown powder, which has no affinity for the skin, and any marks can, therefore, be readily removed by simple washing. A carbon paper can be made with this dye by conventional methods, and can be copied on a normal spirit duplicator, though with a rather higher rate of fluid feed than normal and a slightly modified but harmless fluid. In order to develop the final blue copy, a copying paper with a high content of aluminium is necessary. Aluminium is, of course, a normal constituent of papers of this type, though, for the best results, a higher aluminium content than usual is required. This process is already being used to some extent, and full-scale office trials have proved that it is very clean in actual use, and also that it can be satisfactorily applied as a process in office systems working.

MIMEOGRAPHY— STENCIL DUPLICATING

Finally, to complete the story, a few words about stencil duplicating, i.e. the Roneo or Gestetner type of process. Here, a stencil is cut by rupturing the cellulose nitrate film on a tissue paper, in order to permit the ink to pass through where required, and copies are made on a special

duplicator. The inks used are almost invariably black (Carbon Black), though occasionally red, blue, or green inks may be used, coloured with pigments of the toner or Fastel types. These inks are normally oil-based (some are water-in-oil emulsions), made by conventional grinding methods, and more closely related to printing inks than the inks considered earlier. Recently, however, the A. B. Dick Co.[12] has claimed that aqueous inks, free from oil but containing a suitable water-soluble macromolecular compound to increase the viscosity, can be used satisfactorily and have some advantages, notably in drying rate. These inks can be coloured either with pigments or with water-soluble acid dyes.

OTHER PROCESSES

There are many other methods of preparing multiple copies, which do not, in general, depend on conventional dyes or pigments, and, therefore, fall outside the scope of this paper. Processes in commercial use include those depending on heat-sensitive papers[13]; pressure-sensitive systems[14], which eliminate typewriter and pencil carbons in e.g. order pads; and the various photographic processes ranging from the well established ferrocyanide and diazo processes for blueprints to the bewildering variety of photocopiers available for office use.

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Discussion

Mr. H. À BRASSARD: On the whole, it is surprising how little headway seems to have been made with the manufacture of carbon papers. There is no doubt that nowadays some of such papers can be obtained which are non-curling, are non-smearing, make good copies, and last quite well, but they have the disability that they tend to slip.

Mr. A. ARMITAGE*: It would be interesting to speculate on what might have been achieved by the carbon-paper manufacturers, particularly with respect to copying carbons, if even a very small part of the research effort by dye manufacturers into improved dyes for textiles had been concerned with the requirements of the carbon-paper trade. Nearly all the up-to-date recommendations of dye manufacturers to the carbon-paper trade would, allowing for changes in nomenclature, be found early on in the historical section of a textbook on dyes. Since the earliest discoveries, dye developments have been directed to improved fastness and dyeing properties on textiles, and the properties of high tinctorial strength and solubility in non-aqueous solvents required by the carbon-paper manufacturers have been lost.

The lecturer, referring to the important question of a black dye for spirit copying carbons, doubted whether a satisfactory homogeneous black would ever be found. It is questionable whether a serious attempt has ever been made by dye manufacturers in this country to develop such a black, as opposed to selecting known basic dyes and converting to an apparently homogeneous black by a wet mixing process. A more fundamental approach to the problem by the dye manufacturer is required, because there is a danger that, if the shortcomings of dyes available to the carbon-paper trade are not overcome, in the future the use of copying processes employing dyes of British manufacture will gradually give way to alternative copying methods, in particular novel methods developed in the U.S.A. and operated in this country under licence.

Mr. À BRASSARD*: My sympathies lie entirely with Mr. Armitage of the Ellams Duplicator Co. Ltd., and it is high time that his industry received research attention from dye and chemical makers. Many of the dyes exemplified by the lecturer were of pre-1900 vintage, and all except two or three were pre-1920.

Mr. GILL*: In reply to Mr. Armitage, I would agree that most of the dyes used by carbon-paper manufacturers are, at least in chemical constitution, types which have existed since the early days of the synthetic-dye industry. Special brands of the more important dyes, particularly those used in hectograph carbon papers, with high purity, controlled physical form, etc., are, however, made by a number of dye manufacturers. I would also agree that, again particularly in the case of hectograph or copying carbon papers, the dyes used at the present time are in general deficient in one respect or another— they may stain the skin, the copies may suffer from poor definition, lack of strength, or in the number obtainable, and so on. New dyes with the correct properties may well overcome some or all of these problems, and may also be of interest for other purposes, e.g. printing inks. The introduction of Methasol Copying Blue BS (ICI) is an attempt (by a dye manufacturer) to deal with the problem of cleanliness.

Thus, although in the past it was probably true that the research effort of dye manufacturers on dyes of interest for carbon papers (and related subjects such as printing inks) was so small as to be negligible, some manufacturers at least have paid more attention to such topics in recent years, though so far with only limited success. It is, of course, only when a programme of research work has reached a successful conclusion that the fact that it has been carried out becomes generally known.

* Communicated.

The Continuous Dyeing of Wool with Milling Acid Dyes

D. R. LEMIN

Meetings of the West Riding Section held at the Victoria Hotel, Bradford, on 16th January 1958, Mr. G. E. Styan in the chair; of the Huddersfield Section held at Silvio's Café, Huddersfield, on 18th February 1958, Mr. H. Boothroyd in the chair; of the Scottish Section held at the Scottish Woollen Technical College, Galashiels, on 6th March 1958, Mr. J. G. B. McCallum in the chair; and of the Bradford Junior Branch held at the Bradford Institute of Technology on 27th March 1958, Mr. D. T. Young in the chair

It has been shown that loose wool may be successfully dyed continuously with milling acid dyes in very short times at 100°C. in normal scouring machines, thus eliminating normal dyeing machinery. The method is restricted commercially to pale and medium depths. A pad–steam method has been developed for dyeing wool pile fabrics continuously. It has been found that it is not possible to dye wool piece goods satisfactorily by continuous pad–steam methods, owing to the hydrophobic character of the wool and the difficulty of eliminating skitteriness from the dyeings.

Recent years have witnessed considerable advances in the production of synthetic fibres, in the techniques of dyeing all types of fibres, and in dyeing machinery. High-temperature dyeing has been introduced and is now a well established process, and recently it has been suggested that wool may be dyed at temperatures well below the boil. These advances have been in line with the main trends towards the production of dyeings possessing higher wet fastness properties and in the development of simpler and more rapid methods of dye application.

In the field of cellulose dyeing the development and industrial acceptance of several continuous dyeing processes has occurred in the past decade, examples of which are the Standfast molten-metal process [1], the du Pont pad–steam process [2], and the Rydboholm Pad–Roll method [3]. These methods are particularly applicable to piece goods, and since the yardages in the cotton and rayon trades are considerably greater than those in the wool industry, it is not surprising that the main interest for these processes has been confined to cellulosic materials. In view of the non-acceptance of processes of these types in the wool trade, it cannot be assumed that there is any lack of interest in the subject, for a number of patents and papers exist on the continuous dyeing of wool [4], and certainly Indigo (C.I. Vat Blue 1) has been applied to wool continuously for many years. Most of the published information on the continuous dyeing of wool has dealt with acid dyes and so far none of the methods suggested has achieved any degree of popularity. This arises from a number of causes, among which may be mentioned (*a*) a failure to show sufficient economic or technical advantage over existing batchwise dyeing techniques and (*b*) the mechanical difficulties associated with padding a hydrophobic fibre and with drawing wool through a series of nip rollers used in many continuous processes for piece goods.

There has recently been an increase in work on the continuous dyeing of wool in various forms, but so far no comprehensive survey of the field has been attempted. The object of the present work was to undertake a systematic examination of the continuous dyeing of wool in various forms and to assess the practical value of these processes by reference to such factors as reduction in dyeing times, production of level dyeings, and effect on fastness properties. Work has been carried out on (*a*) loose wool, (*b*) pile fabrics, and (*c*) piece goods, and it is proposed to discuss the work in this order.

The Continuous Dyeing of Loose Wool

The first wet process to which wool is subjected is loose-wool scouring, a continuous process in which the wool is passed through a series of bowls containing liquors for desuinting, scouring, and rinsing. It has been suggested by du Pont [5] that the last bowl in the loose-wool scouring machine can be used as the dyebath, thus eliminating the necessity for separate dyeing machinery. This is such a complete departure from generally accepted techniques that it has been considered worthy of some detailed investigation. According to the method suggested, dyeing takes place, from a bath adjusted with formic acid to pH 3·5–4, at or near the boil for a time of 60–90 sec. It has been suggested that in a five-bowl scouring machine the first two bowls are used for scouring, the next two bowls for rinsing, with dyeing being carried out in the fifth bowl. In a six-bowl machine the last bowl can be used as a rinse after dyeing, and in a four-bowl machine one of the rinses prior to dyeing may be eliminated.

The rinsing bowl prior to the dyeing bowl is used as a preheating vessel for the wool, being held at 70–80°C. The dyeing bowl is heated to 96–99°C., and is charged with the requisite amounts of acid and dye. As the wool is fed into the dyeing bowl, dye and acid are fed in at a rate to compensate for the removal of these substances by the wool. The advantages claimed for the method are—

(1) Saving in dyeing costs
(2) The wool is in a superior condition to that dyed in conventional loose-wool machinery
(3) Fastness equal to that of conventional dyeings is combined with superior levelness.

Offset against this is the fact that the minimum weight of wool recommended for processing is of the order of 4,000 lb. or a 4-hr. run of the scouring range.

The method has been evaluated from the points of view of the selection of suitable dyes and the working out of a method which could yield reproducibility and consistency of colour throughout a run.

RATE OF ADSORPTION OF ACID AT 100°C.

Since the time of dyeing by the method suggested is so short, the first topic investigated was that of the rate of adsorption of acid from long liquors at 100°C. In a normal loose-wool scouring machine a typical liquor ratio is of the order of 700 : 1, and this was used throughout the experiments. Preliminary tests using a dyebath pH of 3·5–4 had indicated that the exhaustion of dyes in this pH region was very sensitive to the pH of the wool, time of dyeing, rate of boiling, etc., and it was found that a pH of 2·8 (0·429 g. formic acid per litre) was necessary in order to achieve any consistent degree of reproducibility. The technique used was as follows—

Conditioned loose wool (1·16 g.; dry weight 1·00 g.) was entered into 700 c.c. of a boiling solution of acid for 0·5, 1, 1·5, 2, 3, and 5 min. After immersion, the wool was removed, hydroextracted, and weighed, and its acid content was measured by extraction in cold pyridine solution by the method of Barritt [6]. The concentrations of the acid solutions before and after immersion of wool were measured by titration with 0·05 N. caustic soda. The acid solutions examined are detailed below, and the results obtained are indicated in Table I—

(1) 1% Formic acid
(2) pH 2·8 Formic acid (0·429 g. formic acid per litre)
(3) pH 2·8 Formic acid + 1 c.c. sulphuric acid per litre
(4) pH 2·8 Formic acid + 1 c.c. methanesulphonic acid per litre
(5) pH 2·8 Formic acid, the wool being entered wet.

TABLE I

Adsorption of Acid by Wool from a 700:1 Liquor at 100°C.

(mg.-equiv. of acid per gram of wool)

Time of Immersion (min.)	Wool entered dry				Wool entered wet
	(1)	(2)	(3)	(4)	(5)
0·5	0·580	0·120	0·661	0·392	0·120
1	0·580	0·138	0·811	0·470	0·123
1·5	0·578	0·143	0·851	0·472	0·128
2	0·587	0·138	0·855	0·506	0·136
3	0·587	0·143	0·858	0·566	0·141
5	0·601	0·140	0·875	0·586	0·136

It will be seen that the adsorption of acid by wool is extremely rapid and that equilibrium has virtually been achieved in a time as short as 2 min. It will also be apparent that, in the case of pH 2·8 formic acid, the condition of the wool when entered into the bath (i.e. dry or wet) has practically no effect on either the rate of uptake or the amount of acid adsorbed at equilibrium. From these tests it may be concluded that, in the times of dyeing envisaged, adsorption of acid will be almost complete, and the amount of acid adsorbed will be high enough to cause exhaustion of any dyes likely to be used.

RATE OF ADSORPTION OF DYE AT 100°C.

Having shown that equilibrium between wool and acid can be achieved in times of the order likely to be encountered in practice by this method, the next step was to determine the dyeing properties of a wide range of dyes under conditions of short dyeing times and long liquor ratios at the boil. A selected number of dyes were examined in detail, the effects of the following variables on exhaustion being studied—(1) depth of dyeing, (2) time of dyeing, and (3) liquor ratio (cf. Table II).

It has already been mentioned that a formic acid dyebath of pH 2·8 (0·429 g./litre) was necessary to achieve reproducibility in exhaustion. For convenience of working, subsequent tests have been carried out using a formic acid concentration of 0·5 g./litre, which yields an initial pH of 2·75. The experimental technique employed was as follows—

A dyebath was prepared containing the requisite amount of dye and 0·5 g. formic acid per litre. This was raised to the boil, and in it was placed 1 g. of scoured loose crossbred wool which had been wetted out at 100°C. and then squeezed to 100% take-up. The material was stirred for the first 10 sec. of dyeing, and then allowed to remain in the dyebath for the rest of the dyeing time without mechanical agitation. At the end of the dyeing time the wool was removed, and 40 ml. of the liquor pipetted into 10 ml. of pyridine. This solution was then filtered under vacuum through a No. 4 sintered-glass filter to remove any small fibres, cooled, and estimated spectrophotometrically against a standard solution of dye. All experiments were carried out in duplicate, and in many cases further repeat experiments were carried out. The results obtained with the four dyes examined are given in Table II, the accuracy of the exhaustion figures being ±2%.

The results in Table II indicate that, with the dyes examined, only in a liquor ratio of 100 : 1 is exhaustion of the dyebath complete in dyeing times of 1½–2 min. At 400 : 1 and 700 : 1 liquor ratios a time of 3 min. appears to be necessary to achieve complete exhaustion at 1% depth; and in 1000 : 1 liquor ratio a still longer time would appear to be essential if complete dyebath exhaustion is desired. It is clear, therefore, that in liquor ratios of the order likely to be encountered in conventional loose-wool scouring machinery (viz. 400–700 : 1), if variations occur in the time of passage of the wool through the dyeing bowl, it is likely that alteration in the depth of colour obtained can result and may be significant if the times of passage vary by more than ±10 sec. This will, of course, be of much greater significance with mixture dyeings of two or more dyes. The results in this table taken in conjunction with those in Table I for the adsorption of acid by wool add further confirmation to the classic work of Elöd [7] on the relative rates of adsorption of acid and dye by wool. It will also be seen from these results that in 90 sec. dyeing time the depth of colour applied has a marked effect on exhaustion, the heavier the dyeing the lower being the exhaustion. Again, the effect is more pronounced in longer liquor ratios: in a 700 : 1 liquor at 4% depth the

TABLE II

Effects of Time, Liquor Ratio, and Depth on Exhaustion (%) at 100°C.

Liquor ratio	100:1			400:1			700:1			1000:1		
Depth ...	1%	2%	4%	1%	2%	4%	1%	2%	4%	1%	2%	4%
Time of Dyeing (min.)												
CARBOLAN BRILLIANT GREEN 5GS (C.I. Acid Green 28)												
1	100	—	—	67	—	—	44	—	—	42	—	—
1·5	100	99	95	86	78	69	74	64	50	49	37	21
2	100	—	—	94	—	—	84	—	—	56	—	—
3	100	—	—	100	—	—	100	—	—	90	—	—
CARBOLAN BROWN BLS												
1	98	—	—	82	—	—	72	—	—	68	—	—
1·5	99	95	72	84	83	53	78	64	48	76	69	49
2	100	—	—	100	—	—	88	—	—	88	—	—
3	100	—	—	100	—	—	100	—	—	90	—	—
CARBOLAN CRIMSON 3BS (C.I. Acid Red 139)												
1	93	—	—	62	—	—	41	—	—	27	—	—
1·5	100	90	65	77	68	57	62	46	41	48	35	27
2	100	—	—	94	—	—	72	—	—	51	—	—
3	100	—	—	100	—	—	91	—	—	57	—	—
CARBOLAN BRILLIANT BLUE 2RS (C.I. Acid Blue 140)												
1	100	—	—	67	—	—	47	—	—	36	—	—
1·5	100	96	73	84	67	55	73	62	51	65	43	33
2	100	—	—	100	—	—	77	—	—	77	—	—
3	100	—	—	100	—	—	100	—	—	100	—	—

exhaustions of the four dyes range from 41% to 51%, whereas at 1% depth the corresponding range of exhaustions is 62–78%.

Attention was next turned to the determination of the exhaustion of a wide range of milling acid dyes under the optimum practical dyebath conditions. The exhaustions were measured at varying depths up to 4% dyed for 90 sec. from a formic acid (0·5 g./litre) dyebath using a 700:1 liquor ratio at 100°C. The experimental technique employed was as detailed previously, and the results obtained are given in Table III.

The results in Table III indicate the wide range of dyebath exhaustions which occur with milling acid dyes applied to wool in short dyeing times. In addition, the fall in exhaustion with increase in depth will also be apparent. The exhaustions range from 20% for Coomassie Violet 2RS to 92% with Carbolan Brown BLS at 0·5% depth, and from 15% with Coomassie Milling Scarlet GS to 62·5% with Carbolan Blue BS at 4% depth. It will be clear, therefore, that there are a number of dyes which will be of no practical importance for application by this method, owing to their very poor exhaustion, and that the maximum depth of colour likely to be of interest is of the order of 1%. From these results the dyes indicated with an asterisk (*) in Table III have been selected as being of potential practical interest as far as exhaustion is concerned, the criterion chosen being a minimum exhaustion of 55% at 1% depth of dyeing.

When dyes are applied to wool by conventional methods, the dyer expects and in many cases demands virtually complete exhaustion. However, from the data so far presented on the continuous dyeing of loose wool, it will be clear that complete exhaustion of the dyebath will not be obtained under the conditions likely to be met in practice. In an attempt to increase the exhaustion of milling acid dyes in short times under conditions of long liquor ratio, a wide range of compounds have to be studied as dyebath additives, both in addition to and in place of formic acid.

A number of acids of differing strength were examined together with a number of acid salts and esters. Wetting and swelling agents together with anion-active and cation-active agents were also investigated, and the following list gives a selection of the various compounds used—

Acetic acid
Sulphamic acid
Sulphuric acid
Methanesulphonic acid
Benzenesulphonic acid
Ethyl acetate
Ethyl lactate
Ethyl tartrate
Phenol
Lissapol N
Calsolene Oil HS
Lissatan AC
Cetyltrimethylammonium bromide
Cellosolve
Ammonium dihydrogen phosphate

A further aspect investigated was the possibility of pretreating the wool with various agents in an attempt to increase the rate of dyeing as the result of chemical action on the fibre surface to render it more accessible to dyes. On these lines agents such as soda ash, sodium hypochlorite, hydrogen peroxide, caustic soda in alcoholic solution, and steam were examined.

TABLE III

Adsorption of Milling Acid Dyes by Loose Wool

(700 : 1 liquor at 100°c. for 90 sec.)

Dye	*Colour Index* No.	Dye (%) adsorbed at 0·5%	1%	2%	4% depth
Carbolan Yellow 4GS*	C.I. Acid Yellow 70	0·38	0·69	1·24	2·48
Carbolan Yellow 3GS	C.I. Acid Yellow 72	0·16	0·27	0·40	0·64
Carbolan Yellow RS	C.I. Acid Yellow 71	0·22	0·41	0·74	1·08
Carbolan Fawn RS*	C.I. Acid Brown 49	0·43	0·75	1·26	1·96
Carbolan Brown BLS*	—	0·46	0·78	1·28	1·92
Carbolan Crimson 3BS*	C.I. Acid Red 139	0·35	0·62	0·92	1·64
Carbolan Crimson BS	C.I. Acid Red 138	0·33	0·49	0·58	0·80
Carbolan Blue BS*	C.I. Acid Blue 138	0·42	0·74	1·44	2·50
Carbolan Brilliant Blue 2RS*	C.I. Acid Blue 140	0·40	0·73	1·24	2·04
Carbolan Brilliant Green 5GS*	C.I. Acid Green 28	0·41	0·74	1·28	2·12
Carbolan Green GS*	C.I. Acid Green 27	0·38	0·69	1·24	1·82
Carbolan Violet 2RS*	C.I. Acid Violet 51	0·38	0·65	1·20	2·04
Coomassie Milling Scarlet GS	C.I. Acid Red 97	0·23	0·40	0·66	0·60
Coomassie Yellow 7GS	C.I. Acid Yellow 44	0·33	0·49	0·58	0·80
Coomassie Yellow 6GS*	C.I. Direct Yellow 8	0·38	0·71	1·20	1·00
Coomassie Fast Yellow GS	C.I. Acid Yellow 85	0·28	0·48	0·70	0·76
Coomassie Yellow RS	C.I. Acid Yellow 42	0·27	0·42	0·72	1·20
Coomassie Fast Orange GS	C.I. Acid Orange 33	0·23	0·44	0·82	1·12
Coomassie Fast Scarlet 2GS*	C.I. Acid Red 140	0·38	0·66	1·18	1·80
Coomassie Fast Scarlet BS*	C.I. Acid Red 111	0·32	0·61	1·10	1·32
Coomassie Red PGS*	C.I. Acid Red 85	0·39	0·63	0·90	0·72
Coomassie Red RS	C.I. Acid Red 99	0·28	0·52	0·90	1·56
Coomassie Red BRS*	—	0·30	0·55	0·90	1·08
Coomassie Geranine 2GS	—	0·28	0·51	0·94	1·68
Coomassie Bordeaux BS*	—	0·38	0·66	0·92	0·96
Coomassie Violet RS	C.I. Acid Violet 17	0·20	0·33	0·58	0·88
Coomassie Violet 2RS	C.I. Acid Violet 9	0·10	0·20	0·38	0·78
Solway Violet BNS*	C.I. Acid Violet 34	0·33	0·61	1·16	2·0
Solway Violet BRS*	C.I. Acid Violet 34	0·34	0·55	0·76	1·16
Coomassie Blue GLS	C.I. Acid Blue 102	0·24	0·41	0·74	1·32
Coomassie Blue BLS	C.I. Acid Blue 59	0·29	0·54	0·98	1·68
Coomassie Ultra Sky SES*	C.I. Acid Blue 112	0·41	0·75	1·46	2·40
Coomassie Brilliant Blue RS	C.I. Acid Blue 83	0·19	0·30	0·46	0·72
Coomassie Brilliant Blue GS	C.I. Acid Blue 90	0·24	0·43	0·80	1·48
Coomassie Brilliant Blue FFS	C.I. Acid Blue 15	0·13	0·24	0·38	0·64
Solway Green GS*	C.I. Acid Green 25	0·34	0·56	0·94	1·64
Coomassie Fast Green GNS*	C.I. Acid Green 25	0·32	0·56	0·96	1·80
Coomassie Green TS*	C.I. Acid Green 19	0·38	0·67	1·22	2·00
Coomassie Fast Grey 3GS	C.I. Acid Black 48	0·26	0·44	0·82	1·36

As a result of these tests it was found that pretreatment of the wool with agents known to have a marked effect on its surface structure could effect an increase in the rate of dyeing and hence in the exhaustion in 90 sec. dyeing time. However, in order to achieve an economically significant effect the conditions of treatment needed were such that appreciable fibre degradation as measured by alkali solubility had occurred. As far as the addition of compounds to the dyebath is concerned, the only agent having a profound effect in increasing the rate of dyeing was found to be methanesulphonic acid. The optimum concentration of this agent is 1 ml. per 700 ml. formic-acid dyebath, and under these conditions virtually complete dyebath exhaustion was obtained with a number of milling acid dyes in medium depths.

This advantageous effect was counterbalanced by the fact that the addition of methanesulphonic acid caused a marked change of colour with a number of dyes (e.g. Carbolan Crimson BS) or precipitation of dye in the bath (e.g. Coomassie Fast Grey 3GS). The conclusion was reached, therefore, that little effect of real value was likely to accrue from adding any of the compounds studied to the dyebath or by pretreating the wool prior to entering into the dye liquor.

One of the most important questions facing the dyer is that of the fastness properties of any dyeing. Since by this method dyeing is accomplished in such short times, it was felt desirable to carry out some comparative fastness tests on dyeings produced by this method and by conventional methods. Dyeings (1%) of—

Carbolan Yellow 4GS
Carbolan Crimson 3BS
Carbolan Brilliant Green 5GS
Coomassie Geranine 2GS
Coomassie Blue BLS
Coomassie Fast Grey 3GS

were carried out by the continuous method for 90 sec., and in addition dyeings of the appropriate depth to give by the normal dyeing method the same tinctorial strength of dyeing. These were then subjected to the I.S.O. Mechanical Washing A, acid milling, and Fade-Ometer tests. It was

found that the light-fastness properties of material dyed by the two methods were similar; but that in wet-fastness properties the wool dyed by the rapid method was slightly inferior to that dyed by conventional methods. This suggested that the rapidly dyed material was incompletely penetrated, and when cross-sections of the dyed fibres were prepared it was found that the wool was entirely ring-dyed.

Steaming of the ring-dyed fibres resulted in a gradual penetration of dye into the fibre with a resultant increase in wet fastness to that obtained by the conventional dyeing method. In order to achieve completely penetrated fibres, steaming times of at least 5 min. were necessary, increasing to as long as 30 min. with dyes showing poor migration properties.

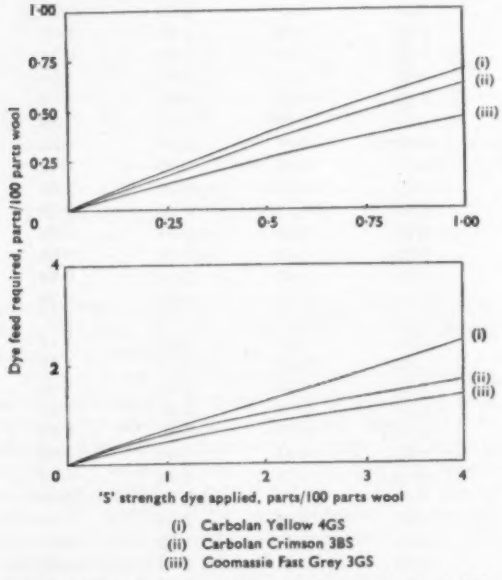


FIG. 1— Adsorption Curves of Milling Acid Dyes (90 sec. at 100°C.; formic acid— initial concn. 0·5/1000 liquor, feed 1·0/100 on wool)

The next step was to examine the reproducibility of the method when applied to a run of dyeings. From the exhaustion data given in Table III it is possible to construct graphs showing the exhaustion (or the dye feed required) plotted against the amount of dye applied (or nominal depth), and from these graphs (Fig. 1) it is a simple matter to calculate the starting and feeding quantities to obtain any colour whose recipe by conventional dyeing methods is known.

Thus a grey which by conventional dyeing methods is matched with—

0·10% Coomassie Fast Grey 3GS
0·11% Carbolan Yellow 4GS
0·066% Carbolan Crimson 3BS
3·0% Ammonium acetate

requires from the graphs the bath for continuous dyeing to be set with—

0·16% Coomassie Fast Grey 3GS
0·13% Carbolan Yellow 4GS
0·08% Carbolan Crimson 3BS
} Recipe 1

the required feeding quantities of dyes being—

0·10% Coomassie Fast Grey 3GS
0·11% Carbolan Yellow 4GS
0·066% Carbolan Crimson 3BS
} Recipe 2

A dyebath was therefore set, at the boil, with formic acid (0·5 g./litre) and recipe (1) calculated on a 4-g. sample of wool. A dyeing was carried out at the boil for 90 sec., and then 1% formic acid and the amounts of dyes given by recipe (2) were added; a further 4-g. piece of wool was entered, and dyed for 90 sec. This was repeated a large number of times, and it was found that excellent reproducibility of colour was achieved throughout the run.

A further check was carried out with a fawn produced with the dyes—

Carbolan Brown BLS
Coomassie Fast Grey 3GS
Carbolan Crimson 3BS

Again excellent reproducibility was found.

From the results obtained it has been concluded that this method forms the basis of a practical procedure for dyeing loose wool continuously with the elimination of conventional batchwise dyeing techniques and machinery. The method is, however, restricted to pale and medium depths of colour, owing to lack of dye build-up to deep colours in the very short dyeing times employed.

The Continuous Dyeing of Pile Fabrics

Plain carpets of the Axminster or Wilton types are generally produced from yarns dyed in Hussong-type machines with level-dyeing acid dyes, and in order to ensure the absolute levelness demanded prolonged boiling times are often necessary. The alternative to yarn dyeing is dyeing in the loose, and this should ensure an ultimately level yarn. In spite of taking the most stringent precautions with either of these dyeing methods, it is still not possible to eliminate completely unlevelness in plain carpets, resulting from such factors as differences in pile warp tensions during weaving, variations in yarn twist, or imperfections in shearing. These factors are completely outside the control of the dyer.

There is, however, much to commend the dyeing of pile fabrics of these types in piece form: the carpet can be woven and then dyed as required, and also dyeing in piece form should eliminate unlevelness due to variations in the physical characteristics of the yarn.

The major difficulty in the application of a continuous dyeing method to pile fabrics arises from the construction of the material and the mechanical problems of even application of dye. Any form of nipping must be completely eliminated if a level dyeing is to be obtained, and methods for overcoming these mechanical problems were patented in 1946 [8]. Essentially the method consists in impregnating the material in a thickened dye solution, the recommended thickening being gum tragacanth, passing it through a slot the exact width and thickness of the fabric to remove excess liquor, and then steaming in order to fix the dye. The material is finally squeezed to remove residual thickening and dried.

In recent months, mainly for economic reasons, alternatives to conventional carpets (e.g. plushes, needle felts, and needle-tufted materials) have assumed considerable importance. Manufacturers of these types of material have been looking for a simple, rapid method of colouring, and the above technique offers a practical solution to the problems.

Work has been carried out to ascertain the most suitable dyeing conditions and to provide information on the choice of dyes for application by this method.

CHOICE OF SUITABLE THICKENING AGENTS

If a pile fabric is impregnated with a cold aqueous solution of a dye containing a wetting agent, the solution tends to fall to the bottom of the pile owing to gravitation. The result is that, when the dye is fixed by steaming, the top of the pile is dyed very much paler than the base. It was found that the addition of gums or other thickening agents to the dye solution prevented the solution from falling to the base of the pile, and resulted in a dyeing in which the pile was uniformly dyed throughout its length.

It had been found empirically that dye solutions containing 20 parts of gum tragacanth per 1,000 yielded satisfactory results. Consequently, in order to evaluate the suitability of various agents as thickenings, their viscosities have been measured at 20°, 50°, and 80°C. against gum tragacanth (20 g./litre) using a No. 4 Ostwald viscometer. The results are given in Table IV.

TABLE IV

Relative Viscosities of Thickening Agents at 20°, 50°, and 80°C.

Thickening Agent	Concn. (g./litre)	Time of Flow (sec.) through No. 4 Viscometer		
		20°C.	50°C.	80°C.
Gum tragacanth ...	20	27	12·1	6·6
Manutex RS (Alginate Industries Ltd.) ...	5	195	85	45·4
Cellofas B (ICI) ...	8·4	118·4	56	29·6
Indalca (Cesalpina, Milan)	10	10·3	6·3	4·8
Nafka crystal gum (Scholten)	15	8·7	5·6	4·4
Gum ghatto (Ellis Jones Ltd.)	5	79·9	26·2	12·9
Solvitose H (Scholten)	23	5·3	All very low, < 3	
Solvitose C (Scholten)	15	7·0		
Solvitex BG (Scholten)	25	5·0		
Solvitex ST (Scholten)	25	213	86·3	41·0

It will be seen from this table that, as the temperature is raised, there is a fall in the time of flow through the viscometer. In addition it will be apparent that there are wide variations in the thickening effects of the products examined. Under these conditions of test, and at the concentrations examined, Manutex RS, Cellofas B, gum ghatto, and Solvitex ST show the highest viscosities over the whole range of temperatures examined. Solvitoses H and C and Solvitex BG at the concentrations tested have extremely low times of flow, and these have therefore been disregarded in subsequent work.

Wool is a hydrophobic fibre, and in order to obtain rapid wetting in the times normally associated with padding operations it is essential to add a wetting agent to any padding liquor. It is well known that wetting agents can exert marked effects on viscosity, and the above viscosity measurements were therefore repeated incorporating Calsolene Oil HS as a wetting agent. Furthermore, since acids, inorganic salts, and other substances also influence viscosity, further measurements were carried out with the addition of ammonium dihydrogen phosphate to the thickening. The results obtained are given in Tables V and VI.

TABLE V

Relative Viscosities of Thickening Agents in the Presence of Calsolene Oil HS (7·5 g./litre)

Thickening Agent	Concn. (g./litre)	Time of Flow (sec.) through No. 4 Viscometer		
		20°C.	50°C.	80°C.
Gum tragacanth ...	20	36·8	15·2	8·1
Manutex RS ...	5	72·9	30·7	22·4
Cellofas B	8·4	69·9	25·5	12·6
Indalca	10	11·6	6·2	4·5
Nafka crystal gum ...	15	5·6	4·2	3·8
Gum ghatto ...	5	81·4	31·2	14·0
Solvitex ST	25	143	64	38·6

TABLE VI

Relative Viscosities of Thickening Agents in the presence of Calsolene Oil HS (7·5 g./litre) and Ammonium Dihydrogen Phosphate (20 g./litre)

Thickening Agent	Concn. (g./litre)	Time of Flow (sec.) through No. 4 Viscometer		
		20°C.	50°C.	80°C.
Gum tragacanth ...	20	37·6	15·6	7·9
Manutex RS ...	5	30·1	14·7	10·4
Cellofas B	8·4	18·4	7·0	4·6
Indalca	10	10·4	5·8	4·4
Nafka crystal gum ...	15	5·1	3·8	3·5
Gum ghatto ...	5	72·4	28·0	11·3
Solvitex ST	25	24	8·1	4·5

From these tables it will be seen that the natural gums (gum ghatto, gum tragacanth, Nafka crystal gum, and Indalca) do not show any appreciable change of viscosity when Calsolene Oil HS and ammonium dihydrogen phosphate are added. On the other hand, Manutex RS, Cellofas B, and Solvitex ST all show marked decreases of viscosity when the wetting agent and the inorganic salt are added. The fall in viscosity of these agents with increasing temperature is also more marked when wetting agent and salts are present. Taking gum tragacanth as a standard, it is possible from Tables V and VI to eliminate all the other thickenings examined except Manutex RS and gum ghatto on the grounds of inferior viscosity at all temperatures in the presence of both wetting agent and monoammonium phosphate. In addition, non-homogeneity of some of the thickenings also rendered them unsuitable for use irrespective of any viscosity considerations. Gum ghatto and Manutex RS were therefore examined as alternatives to gum tragacanth by the preparation of comparative paddings on carpet material.

The carpet was padded through a solution containing—

Carbolan Blue RS	2 g./litre
Calsolene Oil HS	7·5 g./litre
Ammonium dihydrogen phosphate	20 g./litre
Thickening agent	x g./litre

After padding and removal of excess liquor, the samples were steamed in wet steam for 5 min., rinsed, dried, and examined visually for levelness and pile penetration. A concentration of 20 g. per litre for gum tragacanth and values of x of 0–5 g. per litre for both Manutex RS and gum ghatto were employed. It was found that concentrations of both Manutex RS and gum ghatto of 4 and 5 g./litre gave dyeings equal in levelness and penetration to the standard dyeing using gum tragacanth. The paddings containing lower amounts of thickening agent showed weakness of colour at the top of the pile, the body being appreciably heavier in depth. It appears, therefore, that, under comparable conditions of padding, viscosity of the padding liquor is the controlling factor in the production of satisfactory dyeings.

RATE OF FIXATION OF MILLING ACID DYES

The rate of fixation of dyes during steaming is of the utmost importance, since this determines the speed at which the material can be processed and the size of steamer required. For this reason experiments have been carried out to determine the exhaustion of a range of milling acid dyes from thickened pad liquors using the following technique. A padding liquor was prepared cold containing—

Dye	2 g./litre
Manutex RS	5 g./litre
Calsolene Oil HS	7·5 g./litre
Ammonium dihydrogen phosphate	20 g./litre

TABLE VII

Rate of Fixation of Milling Acid Dyes on Wool Pile Fabrics

Dye	*Colour Index* No.	Fixation (%) Time of Steaming (min.)						
		1	2	3	4	5	7·5	10
Carbolan Yellow 4GS*	C.I. Acid Yellow 70	25	55	75	88	90	95	95
Carbolan Yellow 3GS	C.I. Acid Yellow 72	35	45	55	65	75	90	92
Carbolan Yellow RS	C.I. Acid Yellow 71	20	30	40	50	65	80	90
Carbolan Fawn RS*	C.I. Acid Brown 49	20	25	50	60	78	90	95
Carbolan Brown BLS*	—	30	50	70	80	90	95	98
Carbolan Crimson BS*	C.I. Acid Red 138	20	30	50	80	85	98	99
Carbolan Crimson 3BS*	C.I. Acid Red 139	50	65	75	85	90	95	95
Carbolan Violet 2RS*	C.I. Acid Violet 51	45	55	60	70	83	90	95
Carbolan Brilliant Blue 2RS*	C.I. Acid Blue 140	55	80	90	98	100	100	100
Carbolan Blue BS*	C.I. Acid Blue 138	50	75	90	95	98	100	100
Carbolan Brilliant Green 5GS*	C.I. Acid Green 28	50	80	92	98	98	100	100
Carbolan Green GS	C.I. Acid Green 27	50	82	90	97	98	100	100
Coomassie Yellow 7GS	C.I. Acid Yellow 44	20	30	50	55	60	80	90
Coomassie Yellow 6GS	C.I. Direct Yellow 8	30	65	85	90	93	95	97
Coomassie Fast Yellow GS	C.I. Acid Yellow 85	10	20	30	45	55	80	90
Coomassie Yellow RS*	C.I. Acid Yellow 42	50	60	75	80	88	94	96
Coomassie Fast Orange GS*	C.I. Acid Orange 33	40	60	70	75	80	87	93
Coomassie Brown GS	C.I. Acid Brown 22	30	70	93	95	97	98	98
Coomassie Fast Brown RS	C.I. Acid Orange 51	35	50	70	80	85	90	95
Coomassie Fast Scarlet 2GS*	C.I. Acid Red 140	45	70	85	90	93	96	98
Coomassie Milling Scarlet GS	C.I. Acid Red 97	40	60	80	95	96	98	99
Coomassie Fast Scarlet BS	C.I. Acid Red 111	25	50	70	80	85	95	98
Coomassie Red PGS	C.I. Acid Red 85	40	55	70	80	90	96	99
Coomassie Milling Scarlet 5BS	C.I. Acid Red 89	45	60	80	88	93	98	99
Coomassie Red BRS*	—	35	50	70	80	93	98	99
Coomassie Red RS*	C.I. Acid Red 99	30	55	70	80	90	97	99
Coomassie Red GS	C.I. Acid Red 116	30	55	75	78	80	85	90
Coomassie Geranine 2GS*	—	35	50	62	75	90	95	98
Coomassie Violet 2RS*	C.I. Acid Violet 9	25	50	70	75	80	85	90
Solway Violet BRS	C.I. Acid Violet 34	20	45	65	80	85	93	95
Solway Violet BNS	C.I. Acid Violet 34	30	50	70	83	88	95	98
Coomassie Violet RS*	C.I. Acid Violet 17	25	45	55	70	80	85	92
Coomassie Blue RLS	C.I. Acid Blue 92	20	30	40	50	60	80	85
Coomassie Blue BLS	C.I. Acid Blue 59	60	80	90	95	97	98	99
Coomassie Blue GLS	C.I. Acid Blue 102	60	75	90	95	97	98	99
Coomassie Brilliant Blue RS*	C.I. Acid Blue 83	45	55	80	93	97	98	99
Coomassie Brilliant Blue FFS*	C.I. Acid Blue 15	50	55	70	80	90	95	97
Coomassie Brilliant Blue GS*	C.I. Acid Blue 90	50	55	80	95	97	99	100
Coomassie Ultra Sky SES*	C.I. Acid Blue 112	35	55	75	80	85	90	94
Solway Green GS*	C.I. Acid Green 25	35	45	65	75	80	90	93
Coomassie Fast Green GNS	C.I. Acid Green 25	40	60	75	80	90	95	97
Coomassie Green TS*	C.I. Acid Green 19	45	75	92	98	99	100	100
Coomassie Fast Grey 3GS	C.I. Acid Black 4	15	25	35	40	45	50	55

Samples of wool carpet were impregnated with this liquor, the excess was removed to give a pick-up of 300%, and the samples were then steamed without pressure for times ranging from 1 to 10 min. After steaming, a sample of exhaust liquor was removed from the carpet and compared colorimetrically with a sample of the original padding liquor. The results obtained are given in Table VII.

The rate of fixation is seen to vary from one dye to another; but with the exception of—

Coomassie Fast Grey 3GS (55%)
Coomassie Blue RLS (85%)

all the dyes have an exhaustion of 90% or better after 10 min. steaming. Dyeing under these conditions is very much more rapid than with conventional dyeing methods, which is probably connected with the very short liquor ratio used. With the exception of the above two and five other dyes—

Coomassie Yellow 7GS
Coomassie Fast Yellow GS
Carbolan Yellow 3GS
Carbolan Yellow RS
Carbolan Fawn RS

all the remaining dyes examined have exhaustions of 80% or better after 5 min. steaming, which is normally accepted as the maximum commercial steaming time. With the majority of these dyes, therefore, a steaming time of 5 min. is long enough to ensure an exhaustion of at least 80% and to ensure that slight variations in steaming time will not cause variations in colour due to marked changes in exhaustion.

From this work it is possible to arrive at a set of experimental conditions which should yield satisfactory dyeings and also to select a range of dyes having good exhaustion under these conditions. The next step was to examine this range of dyes at high concentration to determine whether there were any defects not hitherto encountered. Accordingly, all the dyes previously evaluated for fixation at 2 g./litre were re-examined at 10 g./litre using the same conditions for steaming and the same additions of Manutex RS, Calsolene Oil HS, and ammonium dihydrogen phosphate. The pad liquor was examined for precipitate prior to padding, the exhaust liquor was examined for precipitated dye or evidence of gel formation, and the dyeing was examined for levelness and penetration through the depth of the pile. The dyes indicated with an asterisk (*) in Table VII together with Coomassie Navy Blues GS, GNS, and 2RNS were found to satisfy all the conditions looked for, and may be considered satisfactory.

ALTERNATIVE FIXING AGENTS

In the work so far described ammonium dihydrogen phosphate has been used as the fixing agent for the dyes during steaming. The use of alternative agents to promote exhaustion with Manutex RS and gum ghatto and tragacanth as thickenings has been examined. These tests were made with Coomassie Blue RLS, as under the standard conditions recommended earlier this has an exhaustion of only 60%. Liquors were made up containing—

Coomassie Blue RLS	2 g./litre
Manutex RS or Gum ghatto	5 g./litre
or Gum tragacanth	20 g./litre
Calsolene Oil HS	7·5 g./litre

and various quantities of acid developing agents as detailed below—

	g./litre
Ammonium dihydrogen phosphate	20
Sodium dihydrogen phosphate	20, 50
Pyridine acetate	2·5, 5, 7·5, 10
Pyridine formate	2·5, 5, 7·5, 10
Pyridine sulphate	2·5, 5, 7·5, 10
Ethyl tartrate	2·5, 5, 7·5, 10
Formic acid	2·5, 5, 7·5, 10

Pile fabric was padded through these liquors and steamed for 5 min. in the usual way. In addition, the stability of the liquors was investigated by allowing them to stand overnight.

With Manutex RS solutions containing pyridine formate or sulphate or formic acid were unstable and precipitated out on standing. With gum ghatto and gum tragacanth all the solutions were stable. Sodium dihydrogen phosphate and ethyl tartrate yielded lower exhaustion than was obtained with ammonium dihydrogen phosphate, and therefore these substances cannot be regarded as satisfactory fixing agents. On the other hand, pyridine acetate, formate, and sulphate at concentrations of 5 g./litre gave exhaustions very close to that obtained with ammonium dihydrogen phosphate and dyeings of similar penetration and solidity. These agents in combination with gum ghatto or gum tragacanth are satisfactory alternative fixing agents. Whilst formic acid (2·5 g./litre) was found to give adequate fixation, the dyeings tended to be skittery, and formic acid was therefore rejected on this count.

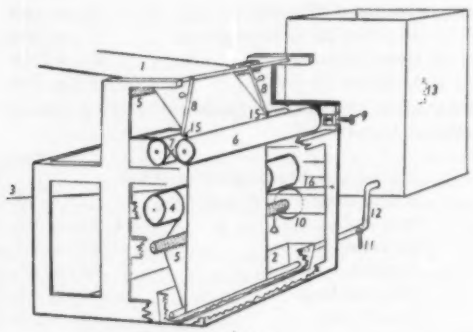
USE OF WETTING AGENTS IN THE PAD LIQUOR

The figure of 7·5 g./litre for the concentration of Calsolene Oil HS used in the above tests was an arbitrary figure arrived at empirically. This concentration yielded rapid wetting of the pile in the short times of passage through the padding liquor. Attention has been paid, therefore, to determining whether smaller amounts of Calsolene Oil HS could be used and also whether Lissapol N was suitable as an alternative. Paddings were therefore carried out with liquors containing the following reagents—

Carbolan Brilliant Green 5GS	2 g./litre
Ammonium dihydrogen phosphate	20 g./litre
Manutex RS	5 g./litre
Wetting agent	x g./litre

where $x = 1$, 2·5, 5, and 7·5 in the case of Calsolene Oil HS, and 2·5, 5, 7·5, and 10 in the case of Lissapol N. After padding, the samples were steamed in the usual manner for 5 min., and examined visually for levelness and pile penetration.

All eight dyeings were level and, apart from those with 1 g. Calsolene Oil HS and 2·5 g. Lissapol N per litre, appeared equally penetrated. These two dyeings, however, showed some evidence of skitteriness and lack of penetration. It was concluded, therefore, that the minimum effective concentrations of these two wetting agents were 2·5 g.



1 Carpet after padding
2 Padding trough
3 Undyed carpet
4 Feed roller
5 Spiked tension-control roller
6, 7 Surface skimming rollers
8, 15 Adjustable side skimming levers
9 Setting screws for variable carpet widths
10, 16 Brake for tension-control roller
11 Feed tap
12 Feed pipe
13 Stock tank

FIG. 2—Laboratory Machine for the Pad-Steam Dyeing of Wool Pile Fabrics

per litre in the case of Calsolene Oil HS and 5 g./litre in the case of Lissapol N.

From the results so far described it was considered that a satisfactory basis for semi-bulk scale had been arrived at, and as a result a small-scale laboratory machine was constructed capable of processing strips of pile fabric up to 9 in. wide. The machine consisted of a padding trough and a slot capable of being adjusted to the thickness of the carpet and fitted with "edge-runners" in contact with the edges of the material. This slot enabled excess liquor to be removed. After passing through the slot the material entered a chamber heated by an open steam pipe to effect fixation of dye and from there it passed to a power-driven mangle, which removed exhausted liquor, as illustrated diagrammatically in Fig. 2.

A number of satisfactory demonstration dyeings have been carried out on this machine, and there is no doubt that the method does enable wool pile fabrics to be dyed in a continuous manner with the production of level, well penetrated results. More recently the method has been applied with satisfactory results on machines capable of processing normal-width pile fabrics, although the mechanical difficulties associated with the even application of dyes in any padding process increase the greater the width of the material being processed.

The Continuous Dyeing of Wool Fabric

This is the aspect of continuous wool dyeing which has received most attention in the past, interest having been taken both in the Standfast molten-metal technique and also in pad–steam methods. In spite of considerable effort, so far no completely satisfactory method has emerged for the continuous dyeing of wool pieces.

The Standfast molten-metal technique has achieved considerable success in the dyeing of cotton and viscose rayon materials, and it is only natural that attempts should have been made to apply the method to wool dyeing. Using conventional wool-dyeing methods (i.e. acid dyebath conditions), the method is not entirely satisfactory for two reasons. Firstly the molten metal in the presence of acid forms a strong reducing system, and a number of dyes, including the Solway Blues and the Coomassie Navy Blues, are subject to decomposition. The second objection arises from metal pick-up, which is greater with wool fabrics than with cotton or viscose rayon. Fox, Seltzer, and Preston [9] have suggested using the molten-metal machine in combination with a neutral dye solution containing a non-ionic wetting agent between 60° and 120°C., and subsequently heating the material in the presence of acid. This overcomes the reducing action encountered in acid solutions and also tends to cut down metal pick-up. The resultant dyeings are, however, not entirely free from skitteriness.

Pad–steam methods have been developed from a method in which the padded material was passed into boiling acid to effect fixation [10]. Early systems suffered from the defect that when the material entered the boiling acid fixing bath, partial stripping of dye occurred, followed by a rapid re-adsorption of stripped dye, resulting in uneven dyeings. In order to prevent this undesirable effect, the use of steam as the developing medium has been suggested, and several patents have been taken out covering padding at temperatures from 20° to 100°C. followed by fixation by contact with steam, hot acid vapours, or hot air under a variety of conditions [4]. In the recently developed Rydboholm Pad–Roll system the padded material is taken and batched in the form of a roll, which is then heated for 1–8 hr. at 95–98°C. to develop the colour and give fibre penetration. Whilst many of these methods give level results, none may be considered entirely free from some degree of skitteriness.

Experimental work has been carried out in an attempt to obviate this defect in all these methods. Fox and Seltzer had suggested (*personal communication*) that improved results could be obtained if the padded material were given a neutral or acid steaming treatment prior to an acid boil, and this was used as a basis for experiment.

Worsted serge was passed through a bath at 95°C. containing—

Carbolan Crimson BS	5 g./litre
Lissapol N	10 g./litre

and then through a wringer set to give 100% take-up. It was then steamed over boiling 50% acetic acid for 3 min. On completion of this acid steaming, the material was passed for 1 min. into a boiling bath containing—

Sulphuric acid (98%)	2·5 g./litre
Dispersol VL	1·0 g./litre

The test was repeated with Carbolan Blue BS (5 g./litre), and the results showed only slight evidence of skitteriness, being more level than similar dyeings omitting the acid steaming treatment.

In another set of dyeings the material was padded at 95°C. through—

Dye	5 g./litre
Lissapol N	10 g./litre
Ammonium oxalate	10 g./litre

expressed to 100% take-up, and then passed into neutral steam for 3 min. followed by a 1-min. boil in—

Sulphuric acid (98%)	2·5 g./litre
Dispersol VL	1·0 g./litre

This method replaced the acid steam of the previous dyeings with a neutral steam, but incorporated ammonium oxalate in the padding liquor. The dyeings by this second method were virtually indistinguishable from those in the previous tests.

In a further set of dyeings the pad liquor contained—

Dye	5 g./litre
Lissapol N	10 g./litre

and—

(*a*)	Acetic acid (glacial)	1 g./litre
(*b*)	Acetic acid (glacial)	5 g./litre
(*c*)	Formic acid (85%)	1 g./litre

The material was padded at 95°C., expressed to 100% take-up, neutral-steamed for 3 min., and then acid-boiled. Again the results showed no visual differences from those previously obtained, being level, but still exhibiting some slight traces of skitteriness.

Some further tests were then carried out using the following pad liquor—

Dye	5 g./litre
Lissapol N	10 g./litre
Acetic acid	1 g./litre

Worsted serge was padded through this liquor both at room temperature and at 95°C., and after expression was subjected to the following development treatments—

(*a*) None

(*b*) Boiled in water for 1 min.

(*c*) Boiled in 1 g. Dispersol VL + 2·5 g. sulphuric acid per litre for 1 min.

(*d*) Neutral steam for 3 min.

(*e*) Neutral steam for 3 min. followed by boiling in water for 1 min.

(*f*) Neutral steam for 3 min. followed by boiling in 1 g. Dispersol VL + 2·5 g. sulphuric acid per litre for 1 min.

Dyeings (*b*), (*d*), and (*e*) were not fully developed and showed loss of colour on entry into the boiling liquor. The results were also skittery. Dyeing (*c*) was fully developed but showed a loss of colour on initial entry into the dyebath, which quickly exhausted back on to the material. The material showed slight unlevelness and was slightly skittery. The best dyeing was (*f*), which was fully developed, showed no bleeding in the liquor, and showed only slight evidence of skitteriness.

The results of these limited experiments on piece dyeing suggest that a neutral or acid steaming followed by an acid boil is superior in producing level dyeings to a method in which the steaming is omitted. In addition, the incorporation of an acid salt such as ammonium oxalate or an acid such as acetic into the pad liquor appears to be advisable. Dyeings produced on the basis of this method are level and show only slight skitteriness, but so far it has not been found possible entirely to eliminate this undesirable effect.

Conclusions

It will be apparent from the work described that it is possible to apply continuous dyeing methods successfully to wool in certain forms. The evidence presented indicates that loose wool may be satisfactorily dyed to pale and medium depths with conventional milling acid dyes in loose-wool scouring equipment, and this should be of importance to the carpet trade. It has been demonstrated that a continuous dyeing method for processing wool pile fabrics is a practical proposition.

With wool fabric, while some progress has been made and level dyeings can be produced on the basis of pad–steam methods, it has not been found possible to eliminate skitteriness completely. Until this problem has been overcome, the large-scale continuous processing of wool cloth is unlikely to be of any real significance, and even then the yardages required to any particular colour may be such that these methods may show no real economic advantage over present-day batchwise dyeing.

* * *

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(*MS. received 19th May 1958*)

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Discussion

WEST RIDING SECTION

Mr. B. KRAMRISCH: In connection with the continuous dyeing of carpets, to what extent is the process applicable with milling dyes when applied in binary and tertiary mixtures: i.e. does any ending take place?

Mr. LEMIN: Padding takes place from a cold, thickened dye solution, and under these conditions there is virtually no adsorption of dye prior to the padded material passing into steam. With binary and tertiary mixture dyeings, therefore, ending does not occur.

Dr. F. F. ELSWORTH: Can the lecturer give any information as to the degree of penetration of the

fibres in the carpets dyed by the padding and steaming method?

Mr. LEMIN: Cross-sections have been prepared from carpets dyed with milling acid dyes by the pad–steam technique, and it has been found that, whilst penetration differs from fibre to fibre depending on its diameter and degree of damage, the overall effect is one of reasonably complete fibre penetration.

Mr. S. R. COCKETT: Is there any appreciable loss of colour by adsorption on the thickening agents?

Mr. LEMIN: There is no loss of colour by adsorption on the thickening agent, whether it is sodium alginate or a conventional type of gum.

Mr. COCKETT: Has the circulation of liquor through the fibre, with turbulence, been examined in the case of wool?

Mr. LEMIN: We have undertaken no work to examine the effect of liquor flow or turbulence on the rate of adsorption of dye by loose wool. Whilst it is to be expected that an increase in liquor flow or turbulence will increase the rate of dyeing, the effect of this on felting may also be significant.

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COMMITTEE—XXIV

Proposed New Test

Colour Fastness to Daylight at High Humidity

LIGHT FASTNESS SUBCOMMITTEE

Introduction

The Standard Method for determining the light fastness of a coloured textile [1, 2] requires a specimen and the standards to be exposed to daylight facing South at an angle of 50–60°. It has been found that in the United Kingdom this results in the exposure being made at an average effective humidity of 20% [3]. Whilst most textiles will be exposed in use at a similar effective humidity, for which the daylight test is therefore completely reliable, there are some which are often exposed during use at a much higher effective humidity, examples being curtains which come into contact with condensed water on window panes, washable articles hung out to dry, raincoats, etc. As many coloured textiles fade much more rapidly when they are exposed at a high effective humidity, it is obvious that the Standard Method may not always be reliable, and in such cases it will be desirable for the Standard Method to be supplemented by a test carried out at an effective humidity much higher than 20%.

The Light Fastness Subcommittee has been studying the problem for some years, and has concluded that at present the only satisfactory method of determining the light fastness at high humidity is to expose the specimen and standards to daylight facing North. This prevents the heating of the patterns by direct sunshine which is the cause of the observation that the effective humidity is much lower than the relative humidity of the atmosphere.

The rate of fading of the standards is unaffected by differences in effective humidity [3]; they can therefore be used for exposures at high humidity, so that a comparison of such a result with that obtained by the Standard Method will provide a quantitative assessment of the humidity sensitivity of the specimen. It should be noted that, whilst coloured materials generally fade much more slowly facing North than facing South, those which are particularly sensitive to humidity will fade at approximately the same rate, so that in such cases—and these are precisely the ones which the test is designed to detect—the time required for testing is not prolonged.

The following method is therefore submitted provisionally for consideration, and the Light Fastness Subcommittee will welcome comments and criticisms. In November 1960 the test will be reconsidered, and in the light of these comments a decision will be taken as to whether it should be adopted as a Standard Method.

Provisional Test

Colour Fastness to Daylight at High Humidity

1. Purpose and Scope

1.1 This method is intended for assessing the resistance of the colour of textiles of all kinds and in all forms to the action of daylight under conditions of high effective humidity. It is intended to supplement the Standard Method (see § 7.1) when the textile may be exposed during use under conditions of high effective humidity, e.g. curtains, washable articles, outerwear, etc.

2. Principle

2.1 A specimen of the textile is exposed to daylight but not direct sunlight, under prescribed conditions, including protection from rain, along with eight dyed wool standards. The fastness is assessed by comparing the fading of the textile with that of the standards.

3. Standards and Equipment

3.1 The standards for this test are those used in the Standard Method for *Colour Fastness to Light: Daylight* (see § 7.1).

3.2 Exposure rack, facing due North and sloping at an angle with the horizontal not less than 45°, covered with window glass to protect the specimen from the weather.

3.3 Opaque cardboard or other thin opaque material, e.g. thin sheet aluminium, or cardboard covered with aluminium foil.

3.4 Grey Scale for assessing Change in Colour (see § 7.2).

4. Specimen

4.1 A specimen of the textile not less than 1 cm. × 6 cm. is used when several periods of exposure are made side by side on the same piece, which is the preferred practice. The specimen may be— a strip of cloth, yarns wound close together on a card or laid parallel and fastened on a card, or a mat of fibre combed and compressed to give a uniform surface and fastened on a card.

4.2 To facilitate handling, the specimen or specimens to be tested and similar strips of the standards may be mounted on a card in some such arrangement as indicated in § 7.3.

5. Procedure

5.1 Expose the specimen (or a group of specimens) and the standards simultaneously to North daylight under the conditions enumerated in § 3.2 in such a manner and for such times as are necessary to evaluate fully the light fastness of each specimen relative to that of the standards by successively covering the specimens and exposed standards throughout the time of the test. (See § 7.3 for two suggested methods of procedure.)

5.2 **Assessment of Light Fastness at High Humidity**— Compare the changes in colour of the test specimen with the changes which have occurred in the standards (see §§ 7.4 and 7.5). The light fastness of the specimen at high humidity is the number of the standard which shows similar changes in colour (visual contrast between exposed and unexposed parts in the test). If the specimen shows changes in colour intermediate between two standards, an appropriate half-rating may be given: e.g. a light fastness of 3–4 means that the textile is not as fast as Standard 4, but is faster than Standard 3.

5.3 If the colour of the specimen is more fugitive than that of Standard 1, a rating of 1 is given.

6. Report

6.1 Report the numerical rating for light fastness.

7. Notes

7.1 *Standard Methods for the Assessment of the Colour Fastness of Textiles*, p. 24, or *B.S.* 1006 : 1955.

7.2 See the following sections—

(*a*) *Colour Fastness of Textiles: General Principles of Testing*

(*b*) *Colour Fastness of Textiles: Grey Scale for assessing Change in Colour.*

7.3 **Suggested Procedures for Mounting and Testing for Light Fastness at High Humidity.**

7.3.1 **Method 1—**

7.3.1.1 This method is considered ideal and should be used in cases of dispute. It requires one set of standards for each specimen under test, and is therefore impracticable when a large number of specimens have to be tested concurrently; in such cases Method 2 (see § 7.3.2) is suggested.

7.3.1.2 Arrange the specimens to be tested and the standards as shown in Fig. 1[1,2] with an opaque cover across the middle third of the specimen and standards. Expose to North daylight under the conditions enumerated in § 3.2. Follow the effect of light by moving the cover and inspecting the specimen frequently. When the contrast between the exposed and covered portion of the specimen is equal to Grade 4 on the Grey Scale (see § 7.2) cover a second one-third of the specimen and standards with an additional opaque cover (*CD* in Fig. 1).

7.3.1.3 Continue to expose until the contrast between the fully exposed and the unexposed portions is equal to Grade 3 on the Grey Scale. If Standard 7 fades to a contrast equal to Grade 4 on the Grey Scale before the specimen does, the exposure may be concluded at this stage.

7.3.1.4 **Assessment of light fastness**— The specimen now shows three separate areas— an unexposed region and two areas which have been changed to different degrees. Compare these changes with the changes which have occurred in the standards and rate the light fastness as in § 5.2. If two different assessments are obtained at the two different degrees of contrast, the light fastness of the specimen is the arithmetic mean of these two assessments.

7.3.2 **Method 2**—

7.3.2.1 This method should be used when a large number of specimens have to be tested concurrently. It enables a large number of specimens differing in light fastness to be rated against a single set of standards.

7.3.2.2 Arrange the specimens to be tested and the standards as shown in Fig. 2[1,2] with card *AB* covering one-quarter of the total length of each specimen and standard. Expose to daylight under the conditions enumerated in § 3.2. Follow the effect of light by lifting the cover periodically and inspecting the standards. When a change in Standard 4 can just be perceived, fix an additional cover *CD* in the position shown in Fig. 2, overlapping the first cover.

7.3.2.3 Continue to expose until a change in Standard 6 can just be perceived; then fix the final cover *EF* in the position shown, the other two covers remaining in position. Expose until either— (*a*) a contrast is produced on Standard 7 equal to the contrast illustrated by Grade 4 of the Grey Scale, or (*b*) a contrast equal to Grade 3 has been produced on the most resistant specimen, whichever occurs first. Remove the three covers.

7.3.2.4 Compare the changes in the specimens with those in the standards and rate the light fastness as in § 5.2.

7.4 Phototropic specimens must be allowed to condition in the dark at room temperature for 2 hr. before assessing the change in colour.

7.5 The term *change in colour* includes not only true "fading", i.e. destruction of dye, but also changes in hue, depth, brightness, or any combination of these characteristics of colour. If the difference in colour is a change of hue or brightness, this can be indicated by adding abbreviations, as follows, to the numerical colour fastness rating—

Bl	Bluer	D	Duller
G	Greener	Br	Brighter
R	Redder	W	Weaker
Y	Yellower	Str	Stronger.

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PUBLICATIONS SPONSORED BY THE SOCIETY'S FASTNESS TESTS CO-ORDINATING COMMITTEE—XXV

Assessment of Weathering Fastness

A Review of the Present Position

K. McLaren

The difficulties encountered in devising a test for the determination of fastness to weathering are described, as well as the attempts made to overcome them. No immediate solution is in sight, but the problem is being jointly studied in England, France, Germany, and Switzerland.

Introduction

Fastness to weathering is a measure of the resistance to colour change which a dyed or printed textile exhibits when exposed in the open air. Whilst atmospheric contaminants such as sulphur dioxide and nitrogen oxides can occasionally produce destructive effects, these are usually ignored in testing fastness to weathering, which invariably implies fastness to the combined effects of daylight and water. Although fading by weathering is caused by light, a light fastness test is of only limited value where outdoor exposure is concerned because of the varied effect of moisture. In some cases— the light fastness standards, for example— the rate of fading is only slightly accelerated if the moisture content during exposure is high, whilst in others a high moisture content increases the rate of fading up to twenty or more times compared with the dry rate; significant increases occur most frequently with cellulosic fibres, and these are the ones most frequently used for articles which have to withstand outdoor exposure, e.g. awnings, tent cloths. The presence of short-wave ultraviolet radiation (300–330 mμ.) absorbed by window glass may also contribute to the acceleration.

It is, therefore, possible to have two patterns which fade at the same rate under glass (i.e. they possess the same light fastness), but in the open in a temperate country one may fade very much more rapidly than the other. The primary function of a weathering test is to bring out the difference between them under outdoor exposure conditions.

The problem of developing a weathering test has been studied for many years in several countries, including the United Kingdom, and in July 1956 the Society of Dyers and Colourists put forward a test based on the work of Butterworth and Guthrie[1] for discussion by the Colour Fastness Subcommittee of the International Organisation for Standardisation (ISO/TC 38/SC 1) at its meeting in New York in September 1956. This test was not accepted, the subject being left for consideration before the following meeting in September 1958. It was never published, however, as subsequent work showed it to be unreliable (*vide infra*), and at the next meeting of SC 1 it was withdrawn. However, in spite of continued study, the Light Fastness Subcommittee was not in a position to submit an alternative method, but felt that a review of the difficulties and possible alternative methods of solving them might help. Such a review was, therefore, submitted to ISO for consideration, and the following is an expanded version of it.

General Considerations

In common with all other fastness tests, the ultimate object of a weathering test is to provide information as to how the dyed or printed textile will withstand the conditions encountered in normal use. This information is always given in the numerical grading 1–8 for light and 1–5 for all other tests. It must be assumed that this principle will be followed in the case of weathering, although it would be possible to categorise dye–fibre combinations as e.g. "suitable", "borderline", and "not suitable"; this has been done provisionally by Imperial Chemical Industries Ltd. Dyestuffs Division[2].

It is essential to realise immediately that the behaviour of a dyed or printed textile exposed in the open will vary widely. If the material is not sensitive to moisture, then the amount of fading will depend only on the amount of light falling on it, and therefore an awning made of such material and used for a year in Cairo will have faded much more than one used in Manchester, because the average duration of sunshine is 3760 hr. per annum in Cairo and only 1050 hr. in Manchester. If, however, the material is sensitive to moisture, then the effect of relative humidity, rain, and dew can easily outweigh the lower amount of sunshine: to take an actual example, three summer months' exposure in Cheshire (650 hr. sunshine) produced almost as much fading on a dyeing of the red azoic combination Brentamine Fast Red LTR→Brenthol ITR (C.I. Azoic Diazo Component 42→C.I. Azoic Coupling Component 12) as four months in Bombay during the sunny period (1200 hr. sunshine).

It follows from this that resistance to weathering must be dependent on the place of use: material showing a high resistance in a sunny and dry country may fade rapidly in a cloudy and damp country. This dependence is not, of course, unique: light fastness also depends on place, so that determinations made in, say, Bombay will not always be valid in England, for example; it is undoubtedly more acute, however, in the case of weathering.

TESTING FASTNESS TO WEATHERING

There are two possible methods of testing fastness to weathering— the first where the exposure is made in the open air (natural weathering) and the second in a weathering lamp (artificial weathering)— and both possess advantages and defects. Both require a method of assessment, but before considering this aspect (which is somewhat controversial) it is desirable to compare the two methods.

Natural Weathering

The advantages of a natural weathering test are—

(1) It is much more likely to be reliable, providing that the test is made in the same kind of climate as the finished article will be exposed in; it would have to be used if a fabric, found suitable in a lamp, failed in actual use

(2) It is cheap.

The defects of such a method are—

(1) It takes a long time—probably six to twelve months are necessary to determine suitability

(2) It will generally be difficult to make exposures in different parts of the world, yet a single exposure may not be reliable; spraying the specimens with water might be used in a dry country to simulate exposure in a damp country, but this will be difficult in routine testing

(3) In industrial districts, soiling of the specimens may exert a protective effect, and whilst this would not necessarily be detrimental if the material were to be used in such a district, such restrictions will rarely apply; frequent washing will, therefore, be necessary in such districts, and it is extremely difficult with some fabrics to remove all occluded dirt

(4) The test may not be reproducible even in the same place if the climatic conditions vary widely; this defect will be greatest the shorter the exposure period, and may be negligible if a 12-month minimum period is chosen.

Artificial Weathering

The advantages of an artificial weathering test are—

(1) It is much more rapid: two weeks' exposure will usually suffice

(2) Conditions can be set to simulate exposure in various climates

(3) The degree of reproducibility can be very high

(4) Exposures can be made in industrial districts.

The only defects are—

(1) High capital outlay and running costs of equipment

(2) The possibility of unreliability of the assessment.

Methods of Assessment

In both natural and artificial weathering tests some method must be prescribed for assessing the results of the exposure. Existing fastness tests suggest three possibilities—

(A) USE OF THE GREY SCALE

In this method, a specimen is exposed for a specified time and the effect assessed by comparison with the Grey Scale for assessing Change in Colour. This method has been used by J. P. Niederhauser[3] for both natural and artificial weathering tests. Its chief defect lies in the fact that exposures cannot be specified on a time basis in natural weathering, and in a lamp the light output decreases with age, except in the case of the carbon arc, which cannot be accepted for reasons which will be discussed later.

Whilst this method is of value in comparing exposures in different places at different times, it is not really suitable for assessing fastness to weathering.

(B) USE OF SPECIAL WEATHERING STANDARDS

The idea of selecting five (or eight) weathering standards is initially very attractive, and independent attempts to establish these have been made by E. Brunnschweiler[4], Courtaulds Ltd. (personal communication), and the author.

In choosing a set of weathering standards, one's initial reaction is to select dye–fibre combinations which are sensitive to weathering, i.e to the combined effects of light and water. This, however, means that the standards must be more closely spaced when exposed under dry conditions (e.g. Arizona and Egypt) than under relatively wet conditions (e.g. the United Kingdom): this will inevitably make assessment difficult, and in the theoretically limiting case, where all standards fade at the same rate under dry conditions, assessment will be impossible.

There is another objection to the use of standards of this type: consider a dyed pattern whose weathering fastness is 4 against such standards when exposed under dry conditions and whose sensitivity to moisture content is the same as that of Standard 4; whether this is exposed under damp or dry conditions, its weathering fastness must always be 4, yet because it is moisture-sensitive, it will withstand outdoor exposure better under dry conditions than under wet, and should, therefore, be given a different rating.

This would seem to be a fundamental objection to the use of weathering standards of this type, and therefore one must choose for the standards dyed patterns whose fading rates are not affected by moisture content but which will not bleed or sweal under the action of rainwater or soap used for washing them after exposure. The AATCC light-fastness standards are stated to be of this type, but the fugitive component is somewhat sensitive to moisture content; they are quite unsuitable for use as weathering standards because the fugitive component rapidly fades, resulting in bad spacing, and the fast component rapidly goes dull, making assessment very difficult.

However, if this argument is accepted, and weathering standards are chosen which are affected solely by the amount of light falling on them, then there would appear to be no need to use weathering standards at all: one could use the light-fastness standards exposed simultaneously but under glass or, because it absorbs less ultraviolet radiation, Perspex (polymethacrylate resin).

(c) USE OF LIGHT-FASTNESS STANDARDS

The ISO Light-fastness Standards were used for assessing weathering fastness long before their use was preferred on theoretical grounds, being used by Butterworth and Guthrie [1]. Their method consisted in exposing the specimens and standards to the light from an enclosed carbon arc and at the same time spraying the specimen, but not the standards, with water; this method had been found by them to give very good correlation with natural weathering conditions on a range of spun-dyed viscose rayon. In 1955 ICI Dyestuffs Division published weathering fastness figures obtained in a similar manner for their range of anthraquinonoid vat dyes and certain azoic combinations of high light fastness [5]. In the summer of 1957 the vat range was exposed for 3 and 6 months in the open, facing south, in Wilmslow, Cheshire, and the weathering fastness assessed by comparison with the light-fastness standards exposed simultaneously but under glass. When the two sets of results were compared, the degree of correlation was found to be very poor; this is shown in Fig. 1, where the fastness in the carbon-arc weathering lamp is plotted against the results obtained outdoors. The spread of points on both sides of the equivalence line showed that better correlation could not be expected by altering e.g. the wet–dry cycle, and the lack of correlation was, therefore, assumed to be due to the marked spectral difference between daylight and the light from the enclosed carbon arc. The use of a weathering lamp based on a xenon arc is, therefore, an attractive alternative, and must be studied as soon as possible.

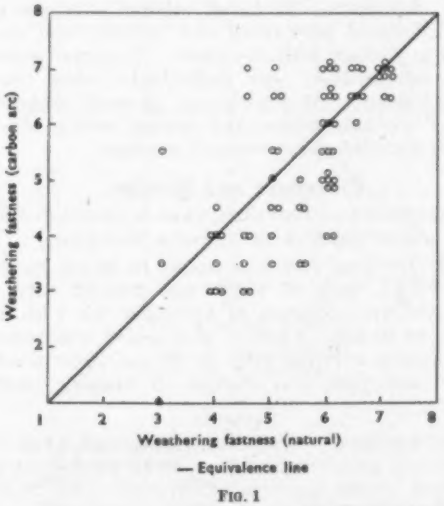


FIG. 1

In order to confirm that the natural method was the more reliable, the results by both methods were plotted against the weathering classification of the International Association for the Felisol Fastness Label, as this represents the accumulated knowledge of the world's leading dye manufacturers on this subject.

The results are shown in diagrammatic form in Fig. 2 and 3, which clearly indicate that the

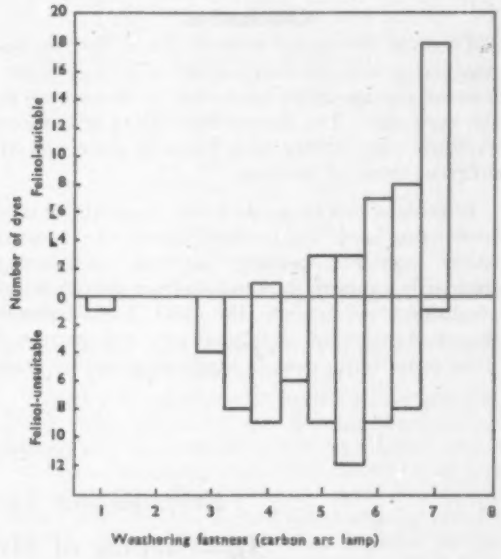


FIG. 2

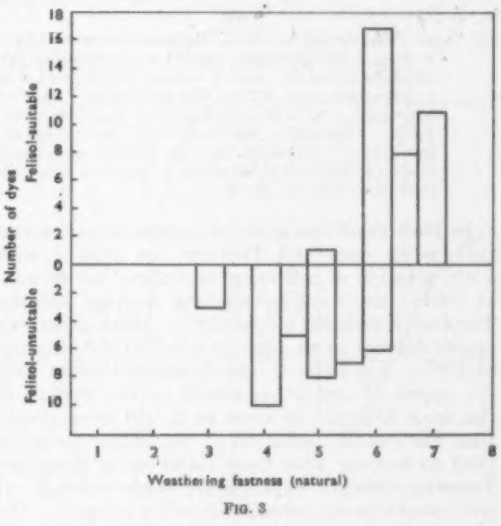


FIG. 3

natural weathering test gives a much more reliable result. It is interesting to note that all Felisol-suitable dyes were rated 6 or higher by the natural weathering method under the 1957 conditions of rain and sunshine, with one exception, Caledon Yellow 3R, which was only rated 5; the criterion for suitability in the case of yellow, however, is lower than for other colours because of the paucity of fast dyes of this hue.

The use of light-fastness standards for assessing weathering fastness is particularly attractive for two main reasons: firstly the development and international acceptance of a set of weathering standards would take many years; and secondly the significance of the 1–8 light-fastness scale is so widely known that the statement that a fabric has a weathering fastness of 5 immediately conveys a great deal of information as to its behaviour in use.

Conclusions

There is obviously a need for a fastness-to-weathering test to supplement or replace light-fastness testing where fabrics are to be exposed in the open air. The destructive effects of outdoor exposure vary widely from place to place and at different times of the year.

Exposures can be made in the open air or in a weathering lamp, and in either case can be assessed either against specially selected weathering standards exposed simultaneously under identical conditions or against the ISO Light-fastness Standards exposed simultaneously but protected from water (rain, dew, or artificial spray) by glass or preferably polymethacrylate resin, or by a mechanical device if a lamp is used.

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(*Received 9th September 1958*)

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[1] Butterworth, E., and Guthrie, J. G., J.S.D.C., **71**, 587 (1955).
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COMMUNICATION

Reclamation of Fibres from Rags
III— Action of Hydrazine on Terylene

A. FILSON and J. B. SPEAKMAN

The extent to which Terylene is attacked by 2% solutions of hydrazine in various alcohols at 100°C. is closely, but inversely, related to the heats of mixing of hydrazine and the alcohols. With glycerol and ethylene glycol the heat of mixing is high, and it has been shown that ethylene glycol forms a well defined 1 : 1 complex (m.p. 9·2°C.) with hydrazine. Dilute solutions of hydrazine in these solvents contain little free hydrazine, and it is not surprising, therefore, that they cause little degradation of Terylene in 40 min. at 100°C. Conversely, the most rapid destruction of Terylene is brought about by solutions of hydrazine in less reactive solvents, such as toluene and *iso*amyl benzyl ether. Such solutions have the additional merit of discriminating sharply between wool and Terylene, thus allowing the former to be recovered from mixtures for re-use.

In Part II of this series of papers it was shown that, when wool and Terylene are treated with a 2% solution of hydrazine in butanol for 60 min. at 100°C., the wool suffers little damage but the Terylene is reduced to powder [1]. Wool undergoes severe damage in an aqueous solution of hydrazine at 100°C., and butanol was chosen as solvent with the object of restricting attack to the surface of the wool fibres [2]. As soon as it had been shown that the butanol solution of hydrazine could be used to recover wool from mixtures of wool and Terylene, further experiments were carried out with solutions of hydrazine in other solvents. The object of the work was to discover the principles on which the selection of a solvent for use in commercial processes should be based.

Experimental

MATERIALS

(*a*) HYDRAZINE— Anhydrous hydrazine (99·6%), supplied by Whiffen & Sons Ltd., was used without further purification.

(*b*) TERYLENE— A spun yarn (2/27s worsted count), composed of 4-denier filaments, was purified by extraction for 12 hr. each with alcohol and ether in a Soxhlet apparatus. The yarn was then stored in the humidity room (65% R.H., 22·2°C.).

(*c*) WOOL— A 2/32s worsted yarn, made from 64s merino wool, was purified in the same way as the Terylene yarn.

(*d*) SOLVENTS— Methanol, ethanol, *n*-propanol, and *n*-butanol were dried over calcium and distilled in contact with the metal. Toluene, which was sulphur-free, was redistilled before use. Benzyl alcohol, ethylene glycol, glycerol, ethanolamine, triethanolamine, and *iso*amyl benzyl ether were redistilled under reduced pressure.

Procedure and Results

1. TREATMENT OF TERYLENE YARN WITH SOLUTIONS OF HYDRAZINE IN VARIOUS SOLVENTS

The Terylene yarn was wound in 30-yd. hanks (1·7–1·8 g.), each of which was treated with a 2% (vol./vol.) solution of hydrazine for 7 hr. at 50°C., or 40 min. at 100°C., in a sealed, evacuated tube, using a liquor ratio of 30 : 1. After treatment, the yarn was washed in running water

TABLE I

Solvent	Breaking Load (g.) of Yarn treated at 50°C.	Breaking Load (g.) of Yarn treated at 100°C.
None (untreated) ...	1600	1590
Methanol	475	344
Ethanol	330	216
n-Propanol	472	156
n-Butanol	500	42
Benzyl alcohol... ...	970	300
Ethylene glycol ...	1560	1350
Glycerol	1620	1515
Ethanolamine	—	Destruction in < 10 min.
Triethanolamine ...	—	680

overnight and then dried *in vacuo* over anhydrous calcium chloride. The breaking load of the treated yarn was determined with 50-cm. lengths on the Uster machine, and each of the results given in Table I is the average of 20 tests. During the course of the work 200 tests were carried out on the untreated yarn, and the average breaking load was found to be 1580 g., with a coefficient of variation of 7·6%.

2. TREATMENT OF TERYLENE YARN WITH SOLUTIONS OF HYDRAZINE IN MIXTURES OF *n*-BUTANOL AND ETHYLENE GLYCOL OR GLYCEROL

The experiments were carried out at 100°C. under the same conditions as above, and the results are shown in Fig. 1.

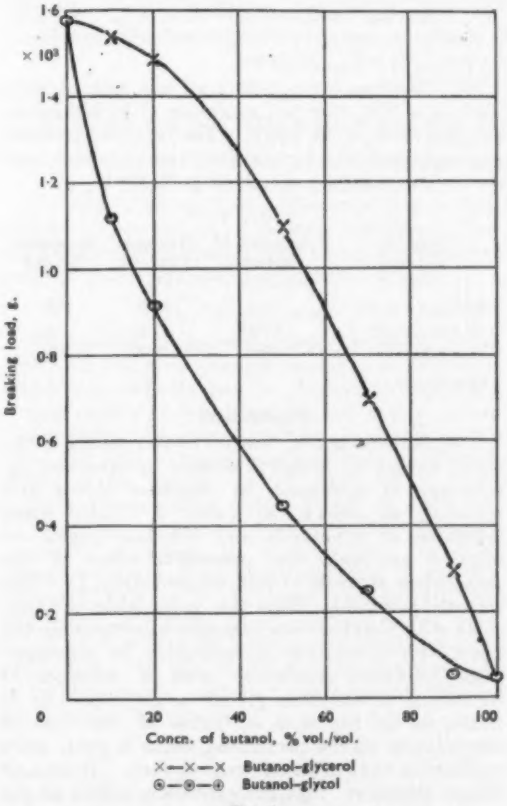


FIG. 1

3. TREATMENT OF TERYLENE YARN WITH A SOLUTION OF HYDRAZINE IN ETHYLENE GLYCOL OR GLYCEROL, FOLLOWED BY TREATMENT WITH A SOLUTION OF HYDRAZINE IN *n*-BUTANOL

After hanks of yarn had been treated with a 2% (wt./vol.) solution of hydrazine in ethylene glycol or glycerol for 40 min. at 100°C., under the same conditions as before, they were washed, dried, and then treated for different times at 100°C. with 2% (wt./vol.) solutions of hydrazine in *n*-butanol. For reference purposes, other hanks were merely treated with the solution of hydrazine in *n*-butanol. The treated yarns were washed, dried, and tested in the usual manner, and the results are given in Table II.

TABLE II

Time of Treatment in Butanolic Hydrazine (min.)	Breaking Load (g.) of Yarn Pretreated with Ethylene Glycol	Pretreated with Glycerol	Not pretreated
0	1480	1540	1500
8	539	760	800
16	232	301	316
24	149	178	186
32	91	107	115
40	44	55	64

4. FREEZING POINTS OF MIXTURES OF HYDRAZINE AND ETHYLENE GLYCOL

A series of solutions of hydrazine in ethylene glycol were prepared for freezing-point determinations. Each solution was introduced into a test-tube containing an alcohol thermometer and a hand-stirrer. The tube was mounted within a larger tube, so that it was separated by an air-space from the freezing mixture of solid carbon dioxide and ethanol, which was itself contained in a Dewar flask. Supercooling was encountered in only a few cases, when the concentration of hydrazine was more than 70% (wt./wt.), and the freezing-point diagram is shown in Fig. 2.

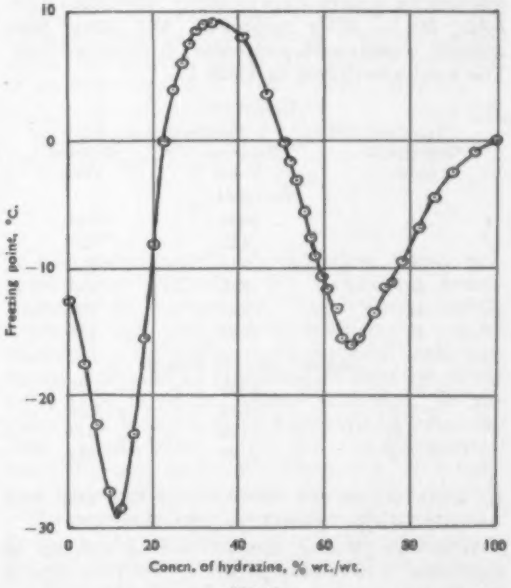


FIG. 2

5. HEATS OF MIXING OF HYDRAZINE WITH VARIOUS SOLVENTS

Hydrazine (0·2 mole) was added to the stirred solvent (0·5 mole) in a Dewar flask over a period of 45 sec., the rise in temperature being noted on a thermometer graduated in tenths of a degree Centigrade. After the solution had cooled to the original temperature, the temperature rise was duplicated by passing a measured current through a calibrated nichrome resistance immersed in the

solution. Values for the heat of mixing of hydrazine with the various solvents are given in Table III.

TABLE III

Solvent	Heat of Mixing at 20·3°c. (cal./mole N_2H_4/2·5 moles of solvent)	Heat of Mixing at 50·0°c. (cal./mole N_2H_4/2·5 moles of solvent)
Methanol	1650	1460
Ethanol	630	492
n-Propanol	350	99
n-Butanol	265	—
Benzyl alcohol... ...	2220	1900
Ethylene glycol ...	3320	2875
Glycerol	3600	3600

6. TREATMENT OF TERYLENE AND WORSTED YARNS WITH SOLUTIONS OF HYDRAZINE IN INERT SOLVENTS

Although hydrazine is not readily soluble in toluene and *iso*amyl benzyl ether, 2% (wt./vol.) solutions can be obtained at raised temperatures below 100°c. When Terylene yarn was treated with such solutions at 100°c., degradation was extremely rapid, being complete in under 10 min. More dilute solutions of hydrazine (0·5%, wt./vol.) were, therefore, used to follow the rate of degradation of Terylene. In these experiments equal dry weights of Terylene and conditioned worsted yarn (regain 15·6%) were together treated with the solution for a given time at 100°c., the liquor ratio being 30:1. After treatment, the yarns were washed, conditioned, and tested in the usual way. The results are given in Table IV.

TABLE IV

Time of Treatment (min.)	Breaking Load (g.) Terylene Yarn	Breaking Load (g.) Worsted Yarn
	TOLUENE	
—	1600	344
8	432	325
16	371	330
24	291	280
32	221	301
40	<20	253
	*iso*AMYL BENZYL ETHER	
—	1565	325
2·5	600	325
5·0	156	319
7·5	<20	325

7. ANALYSIS OF THE PRODUCTS OF THE REACTION BETWEEN HYDRAZINE AND TERYLENE

When Terylene is treated with a solution of hydrazine in *n*-butanol at 100°c., the yarn-form is retained even when the breaking load is reduced to 4% of the original value. Further treatment causes the filaments to break up, first into fibrils and then into powder. The three stages of degradation were examined in the following way—

(i) Terylene yarn was treated with a 2% (vol./vol.) solution of hydrazine in *n*-butanol for 40 min. at 100°c., using a liquor ratio of 30:1. When the yarn was washed, dried, and re-weighed, no change in weight could be detected, and the nitrogen content was only 0·5–0·8%. The treated yarn was readily soluble in phenol, and cryoscopic measurements showed the molecular weight to be 915.

(ii) Terylene yarn (1·0000 g.) was treated with 10 ml. of a 5% (vol./vol.) solution of hydrazine in *n*-butanol for 1 hr. at 100°c. The resulting fibrils were filtered off, washed with hot butanol, dried, and weighed (0·8645 g.). When the filtrate was cooled to 0°c., a flocculent precipitate separated out. This was filtered off, washed, and dried. Its nitrogen content was 23·8%, and the molecular weight, determined as before, was 278 (mol. wt. of terephthalic dihydrazide = 194). The fibrils were next extracted with hot water, and the residue (0·1910 g.) was found to have a nitrogen content of 2·3% and a molecular weight of 685. After the water-soluble material had been recrystallised four times from distilled water, it was found to have the following composition—C 50·4%, H 5·2%, N 28·6%; theoretical for terephthalic dihydrazide—C 49·5%, H 5·2%, N 28·8%.

(iii) Terylene yarn (0·9517 g.) was treated with 5 ml. of a 10% (vol./vol.) solution of hydrazine in butanol for 2 hr. at 100°c. The reaction product was separated into various fractions as before, and the results obtained are given in Table V.

TABLE V

Type of Material	Amount of Material (%)	Nitrogen Content (%)	Molecular Weight
Butanol-soluble ...	6·1	21·8	189
Water-soluble ...	81·4*	27·8	—
Insoluble ...	12·5	2·5	580

* By difference.

Discussion

The most surprising feature of the results is the small extent to which Terylene is attacked by solutions of hydrazine in ethylene glycol and glycerol, as shown in Table I. Even when mixtures of *n*-butanol and ethylene glycol or glycerol are used, the protective effect of the polyhydric alcohols is still evident (Fig. 1). The remote possibility that the polyhydric alcohols react with Terylene was eliminated by treating the yarn with a solution of hydrazine in *n*-butanol after previous treatment with a solution of hydrazine in ethylene glycol or glycerol. As is indicated by the data of Table II, the rate of degradation of the pretreated yarns is even more rapid than that of the untreated yarn. It seemed likely, therefore, that the protective effect of the polyhydric alcohols was due to complex formation with the hydrazine. This view was confirmed by the form of the freezing-point diagram for mixtures of ethylene glycol and hydrazine. As shown in Fig. 2, there is clear evidence of the formation of a 1:1 complex (34% hydrazine), and when the glycol is present in great excess, as in the solutions used for treating Terylene, it is unlikely that much free hydrazine will be available, even at 100°c., for attack on the polymer. In accordance with these observations, the extent to which Terylene is attacked by solutions of hydrazine in the alcohols listed in Table I is closely, but inversely, related to the heats of mixing of hydrazine and the alcohols (Table III).

It is obvious from the preceding results that hydrazine will be most effective in destroying Terylene when it is dissolved in a solvent with which complexes are not formed. Ethanolamine is presumably a solvent of this kind, because the polymer is destroyed with such rapidity (Table I), but a solution of hydrazine in ethanolamine degrades wool at 100°c. and cannot be used to recover wool from mixtures containing Terylene. Solutions of hydrazine in toluene or *iso*amyl benzyl ether do, however, discriminate between Terylene and wool, as shown in Table IV, and the rate of attack on Terylene is very much more rapid than that given by a solution of hydrazine in *n*-butanol.

When Terylene is attacked by hydrazine, the molecular weight decreases in accordance with the severity of the treatment, presumably owing to chain fission in accordance with the following equation—

$$-O\cdot CO\cdot C_6H_4\cdot CO\cdot O\cdot CH_2\cdot CH_2- \;+\; N_2H_4 \longrightarrow -O\cdot CO\cdot C_6H_4\cdot CO\cdot NH\cdot NH_2 \;+\; HO\cdot CH_2\cdot CH_2-$$

Ultimately, the polymer should be converted into terephthalic dihydrazide, and the recrystallised aqueous extract from severely degraded Terylene was found to have a composition in good agreement with that of the dihydrazide.

TEXTILE CHEMISTRY LABORATORY
DEPARTMENT OF TEXTILE INDUSTRIES
THE UNIVERSITY
LEEDS 2

(*Received 31st July 1958*)

References

[1] Atkinson, J. C., and Speakman, J. B., *J.S.D.C.*, **73**, 419 (1957).
[2] Speakman, J. B., *Trans. Faraday Soc.*, **26**, 61 (1930).

EXTERNAL ADDRESS

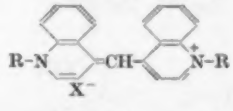
A Century of Progress in the Synthesis of Dyes for Photography*

L. G. S. BROOKER and P. W. VITTUM

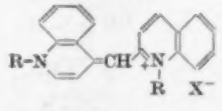
There are four main uses of dyes in photography today— (1) as optical or spectral sensitisers, (2) in antihalation and filter layers, (3) as desensitisers, and (4) in the formation of coloured images.

1. SENSITISERS

The optical or spectral sensitisers confer sensitivity on the photographic emulsion in regions in which it would otherwise be insensitive. Although a wide variety of dyes behave in this manner, those in use today are almost entirely cyanine dyes. In 1856 the first cyanine was obtained by Greville Williams by the action of alkali on a crude quaternary quinoline salt. Vogel in 1873 discovered that a variety of dyes, including Williams's cyanine, rendered a photographic emulsion sensitive to light of the range absorbed by the dye, although this is a simplified picture and the absorption of the dye when adsorbed on the silver halide particles is different from its usual molecular absorption. It was discovered that the presence of lepidine in the quinoline was necessary for the formation of cyanine (I).



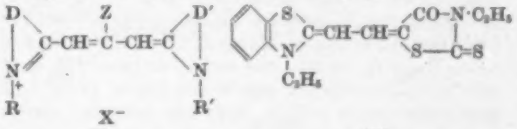
(I)



(II)

The mixed quinaldine and quinoline salts gave the red *iso*cyanines (II), and these dyes were used in the first decade of this century to confer, on a silver iodobromide emulsion, sensitivity in the green region of the spectrum.

The outbreak of the 1914 war caused Pope and his co-workers to investigate the synthesis and structure of cyanine dyes, and the structure of the simpler dyes was placed on a firm footing. It soon became clear that the longer the conjugated chain between the two nitrogen atoms, the longer the wavelength of the long-wave, and photographically important, band. In 1920 the purple Pinacyanol, obtained from quinaldine ethiodide and formaldehyde, was found to contain a 3 C conjugated chain joining the two nuclei (III: D = D′ = residue of quinoline nuclei; R = R′ = C_2H_5; Z = H).



(III)

(IV)

In the years immediately following, König prepared dyes (III: D = D′) containing benzothiazole and benzoxazole rings, which rapidly replaced the quinoline derivatives as useful sensitisers. Later, dyes were prepared containing chains of 5 C and 7 C, the benzothiazole dye of the latter type being an infrared sensitiser. In the years 1925–1940 a variety of methods for preparing both symmetrical (D = D′), unsymmetrical (D ≠ D′), and chain-substituted (e.g. Z = CH_3) dyes were discovered, and a range of heterocyclic nuclei incorporated into cyanine dyes. Cyanine dyes may be considered as resonance hybrids of the two possible canonical states, and the colour of the dyes has been related to the basicity of the nuclei forming the ends of the dye molecule. In 1934 a new class of polymethin sensitisers was discovered by Kendall, the *mero*cyanines, which are vinylogues of amides, e.g. IV, in which resonance is between an uncharged and a dipolar form. A wide range of nuclei has been used at the acidic end of the *mero*cyanine.

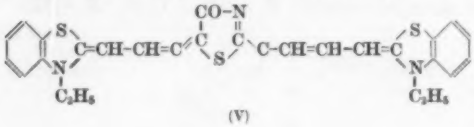
More recently it has been shown that good sensitisers have a planar or nearly planar structure,

* Communication No. 1842 from the Eastman Kodak Co. Research Laboratories published in *Proceedings of the Perkin Centennial* (Lowell, Mass.: AATCC. 1958), pp. 360–408. Abstracted from *Journal of Photographic Science*, **5**, 71–88 (1957) by G. F. Duffin of Ilford Ltd. Renwick Laboratory.

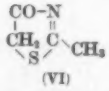
and models or projection formulae of dye structures show clearly how crowding in the molecule prevents coplanarity and thus adversely affects sensitising power, although in some cases a bulky substituent may be twisted out of the plane of the polymethin chain and may leave sensitising power undiminished. An extreme case of this latter behaviour occurs in dyes related to III in which Z is an anion of a heterocyclic ketomethylene nucleus and thus provides the necessary charge to neutralise the quaternary nitrogen. These dyes may possess the colour of the usual cyanine type in one solvent, e.g. methanol, but in another, e.g. 2:6-lutidine, the nuclei Z and D are coplanar and D′ is at 90° to them, thus giving a typical *mero*cyanine adsorption.

Furthermore, dyes which possess planar and yet compact molecules show superior sensitising powers in giving an additional band at a longer wavelength than that normally expected, and this has been shown by Schiebe and Jelley to be due to aggregation on the surface of the silver halide crystal, and this so called J-band aggregation occurs also in concentrated aqueous solution. A further effect is supersensitising, in which a J-band-forming dye is synergised with another substance, which may be another dye, to give a far greater effect than either of the individual components.

Recent synthetic work on new cyanines has yielded new types of dyes bearing no unattached anion. These dyes possess three canonical states, one uncharged and two charged. One member of this new type is (V), prepared from (VI)—

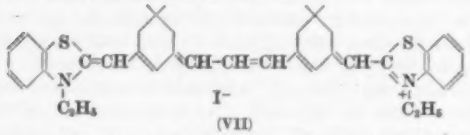


(V)



(VI)

and a variety of compounds may be used instead of VI*. Heseltine has obtained some very long-chain dyes, including one with 13 C joining two benzothiazole nuclei, which give to an emulsion a sensitivity further into the infrared than ever before obtained, with a maximum at 1170 mμ. Dyes containing long chains tend to be very unstable, and these latest long-chain dyes are stabilised by bridging some of the chain atoms with the residues of isophorone units, e.g. in VII—



(VII)

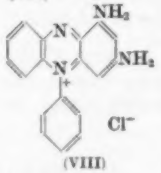
thus holding four of the chain bonds in the *trans* form.

2. ANTIHALATION DYES

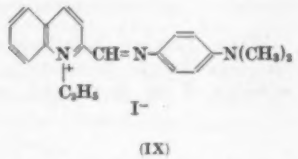
Antihalation dyes are coated on the back of the emulsion support to absorb light coming right through the emulsion to prevent it from being reflected back into the emulsion, thus causing a spread of the image called *halation*. These dyes include modified triphenylmethane dyes and cyanine and similar types of dyes.

3. DESENSITISERS

The light sensitivity of an emulsion can be reduced so that the photographic material may be examined during development. A variety of coloured and colourless substances show this effect, including phenazine derivatives such as Pinakryptol Green (VIII) and cyanine-like materials such as (IX)—



(VIII)

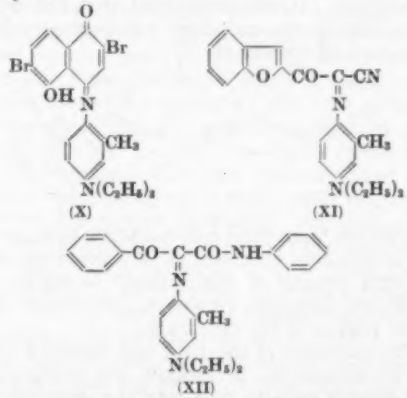


(IX)

It will be seen that VIII and IX contain *even* numbers of carbon atoms between the conjugated nitrogens, unlike the sensitising dyes, which contain an *odd*-numbered chain.

4. DYES FOR COLOUR PHOTOGRAPHY

Modern three-layer colour photography goes back to Clerk Maxwell's demonstration in 1855 that a colour picture could be obtained from red, green, and blue rays, although most processes today use the subtractive process, in which cyan, magenta, and yellow dyes are used to absorb these three primary colours. The chemical basis of modern processes sprang from R. Fischer's discovery in 1911 that an *NN*-substituted *p*-phenylenediamine is oxidised by the exposed silver halide, and the developer oxidation products can be used in reaction with *colour couplers* to form dyes of suitable colours. The cyan indoaniline dye is formed from a phenol, e.g. 2:7-dibromo-1:8-dihydroxynaphthalene, which gives X, while the azomethin dyes from two suitable ketomethylene compounds give the magenta, e.g. 2-cyanoacetylcoumarone giving XI, and the yellow, e.g. benzoylacetanilide giving XII, dyes—



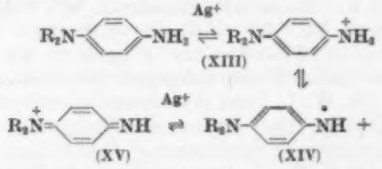
(XII)

These types of dye had been known for many years before their use in colour photography but had found no commercial application. Their relatively low light stability is quite sufficient for use as

* The details of most of this work are as yet unpublished— *Abstractor*.

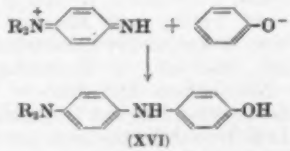
photographic images, and they are not called upon to stand up to washing, etc. Furthermore, the formation of these dyes is very rapid, is quantitative, and gives no detectable by-products, thus fitting the requirements for their use in photographic images. This *colour development* takes place at or fairly near to the site of the silver image, and the silver is subsequently removed by bleaching. For accurate colour reproduction the dye image must be formed only in its correct layer, i.e. the cyan dye in the red-sensitised layer, and so on, and there are two main methods of achieving the desired result. In the first, the light-sensitive material contains only the sensitised silver halide, and the colour couplers are in the processing solutions, the required dyes being formed by selective development. The examples given above are of this type. Alternatively, each layer may contain the coupler *in situ*, and in this case steps must be taken to retain the coupler in the desired layer. This is achieved by *ballasting* them with large groups, such as long chains or a number of rings, and dispersing in an oily emulsion, or by incorporating a sulphonic acid and a long chain, thus rendering the coupler substantive to the gelatin.

The coupling reaction is a very energetic one, and groups such as COOH, SO_3H, or Hal may be eliminated from the reactive positions during dye formation. The mechanism of the coupling reaction has been studied extensively, particularly in recent years with modern techniques. It has now been shown that the silver ion converts the uncharged *p*-phenylenediamine to a semiquinone ion (XIII)—



(XIII) (XV) (XIV)

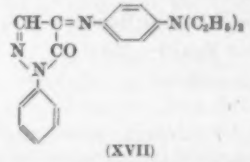
which then loses a proton to become the semiquinone radical (XIV), which, in turn, with more silver ion gives the quinoneimine cation (XV). This then reacts, in a rate-determining step, with the anion of the coupler to give the leuco dye (XVI)—



(XVI)

which then goes very rapidly to the dye.

The light absorption of each of the three components in a colour photograph not only has to be satisfactory itself, but has to match accurately with the other two and not possess any significant absorption outside its own region. The very natures of the indoaniline and azomethin dyes make them suitable for these requirements, but the simple dyes have been much modified by suitable substituents to produce the best possible results. The absorption of the indoaniline dyes, e.g. X, may be explained in terms of resonance with a dipolar form, and the effect of substituents related to the electronic and steric influences of these groups. The absorption of yellow azomethin dyes such as that (XII) derived from benzoylacetanilide can be explained in terms of resonance with two dipolar forms containing a positive $N(C_2H_5)_2$ group and either oxygen negatively charged, and again substituents exert the anticipated effect. A very common class of magenta dyes is derived by using a 5-pyrazolone as a coupler, giving e.g. XVII—



(XVII)

These dyes possess two resonance systems giving rise to dipolar contributors with $N(C_2H_5)_2$ and either the pyrazolone N2 or the oxygen negatively charged, and the latter system gives rise to a secondary, and unwanted, absorption in the blue region. The relative intensities of the two bands are affected by substituents in the pyrazolone, and again the observed facts accord with the electronic influences of the substituents. The unwanted yellow absorption has, however, been corrected by using coloured couplers. Thus, instead of a pyrazolone, the 4-arylazo derivative of the pyrazolone is used. This couples quite normally with the expulsion of the 4-substituent to give the azomethin dye. The unwanted yellow absorption present in the magenta is, however, matched by the yellow absorption of the *unchanged* pyrazolone in the areas where no magenta image is formed, and thus the balance of the total result is unaffected. The effect is utilised in the negative stage of the colour material, and then enables a true rendering to be obtained by suitable correction during printing to give the final positive result.

The light absorption of the dye in the photographic image frequently varies considerably from that of the dye in solution, and clumps of dye crystals are to be avoided, as these flatten and broaden the absorption bands. The stability of the dyes also depends on their physical state, and little is understood about the fading of these dyes. Fading in the dark, however, appears less rapid around neutral pH, and various modifications have been introduced to increase the dark stability of the dyes.

Another type of colour process depends, not on the formation of dyes, but on the bleaching of dyes already present; the bleaching of the dyes is controlled by the reduction of the silver image. Non-diffusing dyes are used in this type of process, and complex azo dyes containing sulpho groups, of the direct cotton type, are found to be suitable.

Yet another process consists in the dyeing of three separate gelatin images, one for each of the primary colours, the thickness being proportional to the developed silver. The three separate images are then transferred to a single material to obtain the final three-colour result. Alizarin derivatives may be used for the cyan and magenta images, and Tartrazine for the yellow.

Notes

Meetings of Council and Committees
October

Council— 1st

Publications— 21st

Fastness Tests Co-ordinating— 15th

Terms and Definitions— 17th

Colour Index Editorial Board— 20th

Examinations Board— 22nd

Data on Identification of Dyes on Textile Fibres— 3rd

International Federation 1959 Congress—
Planning and Co-ordinating— 14th
Social Subcommittee— 27th

Worshipful Company of Dyers Research Medal— 21st

International Relations— 23rd

Abstractors— 31st

Review of Textile Progress— 6th

Deaths

We regret to report the loss by death of Mr. F. L. Barrett, Mr. A. Butterworth, Mr. W. D. Hunter, and Mr. W. Whitwham.

Summer School at Nottingham University 23rd–30th August 1958

Six years after the last Summer School held by the Society, Council set up an executive committee, consisting of Mr. A. W. Carpenter (Chairman), Drs. R. L. Elliott, W. L. Lead, W. R. Moore, and C. B. Stevens, and Messrs. A. S. Cluley, A. P. Kershaw, J. Rayment, and L. Telesz, to arrange a Summer School at Nottingham. Since many potential lecturers and demonstrators had already arranged their holidays, thanks are due to those who readily inconvenienced themselves that the Summer School might benefit.

It was agreed to take as the theme *Theory and Practice today*. In view of recent findings of the Examinations Board, it was decided to concentrate on certain subjects which the general standard of answers to recent papers had shown worthy of attention. At the same time, while the course was to be designed to be primarily of value to students for the Society's Associateship and those instructing them, the needs of men of more mature experience who desired a "refresher" were not to be neglected. Fees were kept deliberately low in order that no-one should be excluded on grounds of cost.

The School was not advertised abroad, in spite of which we did have one visitor from Holland. However, the course attracted 72 students from all parts of the United Kingdom, including substantial contingents from Scotland and Northern Ireland. Fifty-five students were resident at Florence Boot Hall, together with twelve demonstrators and a number of lecturers and members of the organising committee. It is interesting to record that, though students came mainly from dyemaking, research, teaching, and textile organisations, this School also attracted a representative each from the photographic, leather, and metal-colouring industries.

The choice of Nottingham University was a happy one. The modern white stone buildings, scattered along the side of a hill in a park of several hundred acres, the lake at the foot, and the view across the Trent Valley gave an excellent first impression; even the weather did its best.

The Summer School was opened on the Saturday evening, following a modest dinner, by Mr. W. Penn, a Vice-president of the Society, who read a letter of greeting from the President, Mr. John Boulton, who was then abroad. Mr. Penn spoke of the advantages he hoped all present would gain from the School, not merely in learning but in informal discussion and the formation of new friendships. He voiced the thanks of Council to the many who were contributing to the course and wished all a happy and successful week.

After a free Sunday morning, coaches took the party on an afternoon visit to Southwell Minster, followed by a tour of the Dukeries district of Nottinghamshire with tea *en route*. From Monday morning onward a very tight schedule was rigidly followed.

During the mornings, a high standard was reached in the lectures and subsequent discussions, and our thanks and congratulations are due to Dr. W. R. Moore (*Fundamentals of Polymer Chemistry*), Dr. I. Goodman (*Structure and Properties of Fibre-forming Polymers*), Dr. E. Atherton (*Colour Theory today* and *Measurement of Colour*), Dr. W. L. Lead (*Colour and Constitution*), Dr. L. Peters (two papers on *Dyeing Theory*), Mr. B. Kramrisch (*Application of Dyes to Synthetic Fibres*), Dr. F. W. Lindley (*Analysis and Testing*), and Mr. K. McLaren (*Fastness Assessment*).

During the afternoons, three laboratories were open for practical work related to the subjects of the lectures. Choice was offered of fourteen experiments— in polymer chemistry (2), colorimetry (2 general, 2 advanced), dyeing of the newer fibres (4), and testing and analysis (4). Our thanks are due to the twelve demonstrators from the Bradford Institute of Technology, Leeds University, Nottingham and District Technical College, Ciba Clayton Ltd., and Imperial Chemical Industries Ltd. Dyestuffs Division for their skill and enthusiasm; also to the same institutions and firms for the loan of apparatus and gifts of materials. Although we had a free hand with the equipment of the University itself, nearly £2,000 worth of specialised apparatus was "imported".

As a break on the odd afternoon, parties visited works in the district, and we acknowledge the courtesy of Messrs. Spray & Burgass Ltd. of Nottingham and Stevensons (Dyers) Ltd. of Ambergate (dyers), Seal & Turner Ltd. of Sutton-in-Ashfield (knitwear manufacturers), and John Comery Ltd. and R. B. Gamble Ltd. (lace). Two

large parties also visited the new laboratories of the Hosiery and Allied Trades Research Association.

Evenings after 7 p.m. were free, and those who did not wish to find relaxation in Nottingham itself were welcome in the congenial surroundings of the University Staff Club, which had granted temporary membership to the entire School. A notable exception was on the Tuesday, when Mr. C. O. Clark, Chairman of the Examinations Board, made a special evening visit to initiate a discussion on the Examination for the Associateship. This was optional, but the room was full, and the meeting went on for much longer than had been anticipated. Not only did students and teachers present receive many valuable pointers, but a number of interesting matters were raised worthy of further serious consideration.

The final address was given on the Saturday morning by Mr. G. S. J. White, whose paper on *Education in a Changing Society* (published on pp. 733–738 of this issue of the *Journal*) gave some authoritative information on the progress of scientific and technical education in this and other countries and duly underlined the task facing workers in societies such as ours.

Mr. Carpenter, as chief organiser, thanked those mentioned above and also those who had taken the chair at the various lectures— Mr. W. A. Edwards, Dr. R. L. Elliott, Dr. J. W. Illingworth, Dr. E. R. Trotman, and Mr. F. M. Stevenson. We owed a great debt to the University authorities for giving us "open house", and were particularly grateful for the active help of the Registrar, the Heads of the Physics and Chemistry Departments, and their laboratory stewards. The students presented a bouquet to Miss M. Scarth, the Bursar of Florence Boot Hall, for everything possible had been done to ensure their comfort.

The quality of the work of the Summer School impressed the University authorities, and the students, by their behaviour during the course, worthily upheld the dignity of the Society.

Finally, Dr. Elliott and Dr. Moore may be singled out for special mention: not only was their advice valuable in general organisation, but they assumed complete responsibility for staging the practical work.

By the second Saturday, one or two of the organisers were very tired, but happy in the knowledge that their efforts had not been without success. All who took part have greatly benefited, and the intimate contacts established between organisers, lecturers, demonstrators, and students have resulted in friendly understandings that may well bear fruit in the future smooth running of the Society.

ALFRED W. CARPENTER

I.S.O. Conference on Colour Fastness Tests

The fifth conference of ISO/TC 38/SC 1 was held at Lucerne on 10–12th September 1958, the countries represented being Austria, Belgium, Czechoslovakia, Denmark, France, Germany, Italy, Yugoslavia, the Netherlands, New Zealand, Norway, Poland, Sweden, Switzerland, the United Kingdom, and the U.S.A.

The U.K. delegation comprised Dr. P. W. Cunliffe (Chairman of the Society's Fastness Tests Co-ordinating Committee), Mr. K. McLaren (Honorary Secretary of the F.T.C.C.), Mr. G. B. Angus and Mr. J. V. Summersgill (members of the F.T.C.C.), and Mr. W. R. Beath (member of the Pleating Fastness Subcommittee). On the proposal of Switzerland, seconded by the U.S.A., Dr. P. W. Cunliffe was elected Chairman of the Conference.

Working Groups were appointed for Colour Fastness to Light and Weathering (convener Mr. K. McLaren), Standard Test Fabrics (convener Mr. G. B. Angus), and Pleating (convener Dr. F. Buxtorf of Switzerland), and these met separately, reporting subsequently to the plenary session. The permanent Working Group on Washing Tests, which had been set up at the previous meeting at New York, met for informal discussion in the absence of the permanent chairman, Mr. C. H. Bayley of Canada.

The following tests were accepted as proposed draft I.S.O. Recommendations—

Sublimation in storage
Steaming without pressure
Rubbing with an organic solvent
Dry cleaning
Daylight (U.S.A. test)

Additional Standard Depths, viz. $\frac{1}{3}$, $\frac{1}{6}$, and $\frac{1}{12}$, were accepted, and steps are to be taken to include them in the existing I.S.O. Recommendation as soon as the formalities permit. The use of the Crockmeter will no longer be permitted for rubbing tests on loose fibre.

The following tests were accepted as tentative tests—

Burnt-gas fumes
Formaldehyde
Steam pleating

Further consideration is to be given to the following tests, and activities will be continued by correspondence—

Vulcanising
Chlorinated water
Perspiration
Weathering
Standard fabrics
Pleating and setting
Xenon lamp test

Further details of some of the tests are given below—

LIGHT FASTNESS TESTING

(i) *Daylight Tests*

The method of test used in this country has become an I.S.O. Recommendation and has been accepted by all countries except the U.S.A.

At the Lucerne Conference the U.S.A. submitted their own test for fastness to daylight, and this also was accepted as a proposed I.S.O. Recommendation, in accordance with the agreement reached at the New York meeting in 1956 (J.S.D.C., **72**, 578

(1956)) and on the understanding that both methods would receive equal publicity in the U.S.A.

(ii) *Carbon Arc Lamp Test*

A test employing a carbon arc was proposed by the U.S.A., but was found to be unacceptable by the Conference, on the grounds that the nature of the light differed widely from daylight and could not be corrected.

(iii) *Xenon Arc Lamp Test*

A test was submitted to the Conference which had been drawn up by a subcommittee of E.C.E. at their meeting in May 1958, on which the F.T.C.C. had been represented. The test, which is based on the Xenotest lamp manufactured by Quarzlampen G.m.b.H., Hanau, Germany, was accepted as "Under Consideration".

(iv) *Weathering Test*

A proposed test based on the work of Butterworth and Guthrie (J.S.D.C., 71, 587 (1955)) and using a carbon arc lamp was withdrawn. It was agreed that nine countries would collaborate in a study of two other possible methods.

FASTNESS TO WASHING

At the informal meeting of the Working Group it was reported that the interlaboratory trials which had been decided upon at the 1956 meeting had been unexpectedly delayed. A considerable number of fabrics had, however, been sent to the participating countries, and it was arranged that as soon as the work on these had been carried out the secretariat country, Canada, would collate the results. From the information so obtained, it was expected that it would be possible to establish a relationship between the existing AATCC and European tests.

During recent years the views of some Continental countries with regard to the I.S.O. Hand-washing Test had changed, and it was now realised that a test based on a mechanical device was preferable; this attitude is, of course, in line with that consistently taken by the U.S.A. and the U.K. A test specification on these lines was therefore drafted, and this will go forward through I.S.O. in the normal manner.

FASTNESS TO PLEATING

(*a*) *Heat Setting*

The Working Group discussed proposals by France and by Germany. The proposed French test employs the Thermotest apparatus, in which the pattern is subjected to 13 different temperatures simultaneously, and uses a method of assessment based on the temperature at which staining occurs. After considerable discussion, however, the French delegates agreed to adopt the standard method of assessment. The German proposal is based on the "Precision Heating Press" made by BASF, and uses the standard method of assessment. It was agreed that further trials were required, and a permanent Working Group was formed from six member countries.

(*b*) *Steam Pleating*

The proposal put forward by the Society's Pleating Fastness Subcommittee was accepted as a tentative test, subject to the inclusion of two additional test conditions used in France. It is hoped, however, that it may be possible to eliminate some of the test conditions after further experience with the apparatus.

STANDARD TEST FABRICS

The Working Group devoted considerable time to the discussion of the U.S.A. multifibre cloth, which is permitted under the accepted I.S.O. recommendations, but which is in use only in a limited number of countries. It was agreed that the cloth should be standardised, many of the required properties being recorded, but comments were made on the difficulty of doing this with the six fibres involved.

Further progress was made in defining the single-fibre cloths required in fastness testing, and it was suggested that it might be possible to check test fabrics against a master cloth. It was agreed that further work would be undertaken under the supervision of Germany and in co-operation with the U.S.A. and other interested countries.

FASTNESS TO VULCANISING

The U.K. had submitted a revised draft of tests which had previously reached the tentative stage; this had been done mainly on account of a difference of opinion on the composition of the rubber, the temperatures, and the use of controls. As these would require further consideration, it was agreed that the U.K. would be responsible for further negotiations by correspondence with France, Germany, Switzerland, and the U.S.A., in the hope of reaching a decision at an early date.

FASTNESS TO PERSPIRATION

Although the principle of including histidine in the test liquor had been accepted for some time, discussion took place on the amount required, and on matters related to its stability. In order to make progress, a Working Group was set up under Swiss supervision with a view to presenting a report at the next meeting.

FASTNESS TO BURNT-GAS FUMES

The earlier U.K. proposal (Third Report of the F.T.C.C.) using burnt gas was formally withdrawn, and a test submitted by Germany which is based on the generation of oxides of nitrogen by means of sodium nitrite and phosphoric acid was accepted as a tentative test. This test is similar in principle to that given in the Society's Second Report of the F.T.C.C., but contains many desirable additions.

FASTNESS TO RUBBING WITH AN ORGANIC SOLVENT AND TO DRY CLEANING

There has been recognition for some time and in several countries that the existing test for Organic Solvents does not adequately assess the fastness of many goods, particularly those coloured with pigments. It was with little difficulty, therefore, that



Badge of Office of the Chairman of the London Section of the Society of Dyers and Colourists

The main feature of this Badge of Office is the Badge granted to the Society in its Patent of Arms—a purple iris flower within a hexagon. The silver-gilt filigree work depicts the three traditional symbols of the dyer—madder, indigo, and the grain tree. The lettering is in black on white enamel with faint mauve bands. The ribbon is dyed to match Perkin's Mauve.

agreement was reached on a test involving the use of a solvent applied with the Crockmeter.

A Swiss proposal based on the charged solvent system, and using an apparatus of the Wash-wheel or Launderometer type with steel balls, was also accepted. Both these tests were accepted as proposed draft I.S.O. Recommendations.

The changes which have been made in the existing tests and details of the new tests will be published at an early date in the *Journal* as the "Second Supplement to the Standard Methods for the Assessment of the Colour Fastness of Textiles".

P. W. CUNLIFFE

London Section Chairman's Badge

At a meeting of the London Section held in the rooms of the Royal Society, Burlington House, Piccadilly, London W.1, the Chairman of the London Section (Dr. Thomas Henry Morton) was invested with the new badge of office (see illustration facing p. 770) by the President of the Society (Mr. John Boulton). The President said that this type of ceremony was being performed for the very first time in the history of the Society, and he was giving the badge to be used in perpetuity by the London Section. The badge might be regarded as a reward for the persistence and independence of outlook of the London Section Committee in its conviction that the Chairman of the Section should enjoy the possession of some such emblem of his office. Mr. Boulton wished happiness to Dr. Morton and all his successors in office.

Dr. T. H. Morton suitably replied.

Associateship (A.S.D.C.) Examination 1959

This is to be held on Thursday, Friday, and Saturday, 4th, 5th, and 6th June 1959.

Recommended Definitions

The Terms and Definitions Committee intends in the near future to consider comments on the Recommended Definitions published in January 1958 (J.S.D.C., **74**, 40–44). Comments and criticisms are welcome, and should be addressed *in writing* to the Editor and Technical Officer, Society of Dyers and Colourists, 19 Piccadilly, Bradford 1, Yorkshire. Also, requests are invited for definitions of terms which may have given rise to special difficulty.

Perkin Centenary Proceedings

Arrangements have been concluded whereby the proceedings of the Perkin Centenary are being published by Pergamon Press Ltd. under an arrangement which enables contributors to the Perkin Centenary Fund to buy copies at £1 each in place of the published price of 2 guineas. In addition to the four Perkin Lectures, which formed such an important part of the Centenary Celebration, the volume contains a foreword by Sir Robert Robinson, F.R.S., and the speeches given at the Centenary Banquet. Enquiries should be addressed to The Society of Dyers and Colourists, 19 Piccadilly, Bradford 1, Yorkshire.

Worshipful Company of Dyers

At a General Court of the Company held on 8th October 1958, Lieut.-Col. Hugh Francis Holme, M.A., T.D., was elected Prime Warden, and Mr. Richard Francis Rothwell, T.D., was elected Renter Warden.

International High Polymer Conference

Over 500 delegates, one-third of whom came from abroad, attended the International High Polymer Conference held at Nottingham University during 21st–24th July 1958. The two main topics considered were (*a*) the systems and processes involved in the preparation of stereospecific polymers and (*b*) graft and block copolymers. Apart from the general importance of these topics in relation to fibre-forming polymers, a number of the fifty or more papers presented were of interest to readers of this *Journal*. In the opening address Professor H. Mark (Brooklyn) emphasised the importance of helical configurations and pointed out that, whereas previously stiffness had been associated with the crystalline and rubberiness with the amorphous regions, this was not entirely true. Professor G. Natta (Milan) reported work on the elucidation of the mechanism of formation and the structure of stereospecific polymers and, in further papers, considered the preparation and properties of these and of block and graft copolymers. Other papers of interest were on intermolecular forces and chain flexibility by G. Gee *et al.* (Manchester) and on morphological structures in crystalline polymers by Eppe, Fischer, and Stuart (Mainz). Thompson (ICI) spoke on strain-induced crystallisation in Terylene, and deVries (A.K.U., Arnhem) on the relation between birefringence and draw ratio of man-made fibres. Wichterle and Gregor (Prague) reported on the polymerisation of caprolactam, and graft copolymers of caprolactam were discussed by Chapman and Valentine (Leeds University and Tootal Broadhurst Lee Co. Ltd.). Other contributions were on various aspects of block and graft copolymers, and a number of papers were concerned with the effects of the irradiation of polymers in relation to grafting.

W. R. MOORE

Symposium on the Chemistry of Cellulose

A Symposium on the Chemistry of Cellulose will be held in Tashkent, Turkestan. Further details may be obtained from Professor B. A. Kargin, Academy of Sciences, Moscow, U.S.S.R.

National Chemical Laboratory

Changes in both the name and the functions of the former Chemical Research Laboratory at Teddington, Middlesex, have been announced. The Laboratory will concentrate its effort on a few objectives, covering only a limited part of the whole field of chemical research, so as to be able to

make a real impact on selected problems of national importance, such as the following— (*a*) Problems which are appropriate neither to industrial research laboratories nor to universities, because of the necessity for special facilities, experienced staff, and continuity of effort, e.g. the determination of the fundamental physicochemical properties of chemical compounds and the development of techniques of purification of materials such as metals and chemicals, with a view to the supply of standard samples of pure substances for reference purposes. (*b*) Problems the solution of which is of national economic value and would have wide general applications to many industries, e.g. fundamental and applied studies of the corrosion of metals, which has been estimated to cost the country about £600 million a year. (*c*) Problems the solutions of which are urgently required in connection with the nation's atomic energy programme.

Testing Charges

The Manchester Chamber of Commerce Testing House and Laboratory has quoted fees for testing, a service available to the general public. Thus a test for colour fastness to any of eighteen agencies costs 15s.–18s., colour fastness to light (fading lamp) 10s. 6d. + 3d. per hour, and crease resistance 21s. In addition a minimum of 21s. is charged for a certificate.

Indian Colour Fastness Standards

The Indian Standards Institution has published a standard method for determining fastness to daylight as *IS*: 686–1957. Tests for fastness to other agencies are in course of publication, and a complete list of such standards is obtainable from the I.S.I. at Manak Bhavan, 9 Mathura Road, New Delhi 1.

Indian Textile Symposium

The Ahmedabad Textile Industry's Research Association organised a symposium on textiles during 2nd–4th April 1958 at the Govindram Seksaria Technical Institute, Indore. The third day was devoted to chemical processing, and included papers on *Some Essentials of Good Sizing*, *The Economic Use of Azoic Coupling Components on Cotton*, *Bleach Liquor Preparation and Utilisation*, *Water for the Textile Industry*, and *Steam and its Uses*.

Continental Technological Education

A paper by L. Ivanovszky entitled *Chemical Education on the Continent with special reference to Technologists* (*J. Roy. Inst. Chem.*, **82**, 390–395 (June), 526–534 (Aug. 1958)) is most informative in setting out the differences between the systems of technical and technological education in this country and in most other European countries. It outlines differences in primary and secondary education, gives a glossary of terms, and explains the different degrees awarded, e.g. *Diplom-Ingenieur*. Details of methods of training and of examinations to be passed are given for the ten levels of manpower that are distinguished— from *Chemiearbeiter* (chemical labourer) to *Hochschul-Chemiker* (university chemist or technologist). Information on the times devoted to the different subjects studied by "chemical technicians" and in the *Technische Hochschule* in Vienna will enable British chemists to make a fairly precise comparison with their own training in this country.

Research and Technical Education in Alsace

The *Journées Scientifiques de Mulhouse*, held during 21st–23rd May 1958, began with the celebration of the 150th anniversary of the Fabriques de Produits Chimiques de Thann et de Mulhouse, continued with a colloquium on macromolecules, and finished with a conference between university and industry on research and scientific education, which is reported in a special issue of the *Bulletin de la Société Industrielle de Mulhouse* (No. 691 (1958), pp. iii + 128).

An enquiry into the needs of the region had been begun in September 1957, and led to the interesting recommendation that the remarkably successful system of organised periods of works training, found in the U.K., U.S.A., and U.S.S.R., should be introduced in Mulhouse.

An interesting paper by M. Jean Meybeck described the Centre de Recherches Textiles de Mulhouse. Many important advances in dye chemistry had been made in Mulhouse, associated with the names of e.g. Noelting, Rosenstiehl, Koechlin, and Battegay, culminating in the discovery of the Indigosols by Bader. In 1865 a cellulose acetate was prepared for the first time by Schutzenberger. The Centre was founded in January 1947 and functions under the auspices of the Institut Textile de France. The Centre has been housed in the École Supérieure de Chimie, but in the future it will have its own buildings at Illberg. Dyeing, printing, and finishing as well as textile chemistry will continue to occupy an important place among the interests of the Centre.

Other papers discuss the work of the two Écoles Supérieures (Chimie and Filature, Tissage et Bonneterie), and the project for founding a new type of institution, a *Collège Universitaire Scientifique*, at Mulhouse. This last would function under the auspices of the Faculty of Sciences of the University of Strasbourg, and would be devoted to propaedeutic (pre-university) studies.

With regard to the teaching of foreign languages to science and technology students, a suggestion was made that a number of assistant lectureships in science should be awarded to foreigners, who would thus be encouraged to remain in France for a few years after graduation.

In another paper Jacques André stated that the establishment of the chemical industry in Basle was largely influenced by French patent law, which protected the product but not the process of manufacture, and led certain enterprises to establish themselves on Swiss soil. Somewhat analogously, the revocation of the Edict of Nantes resulted in the Huguenots starting the manufacture of silk ribbons in Basle.

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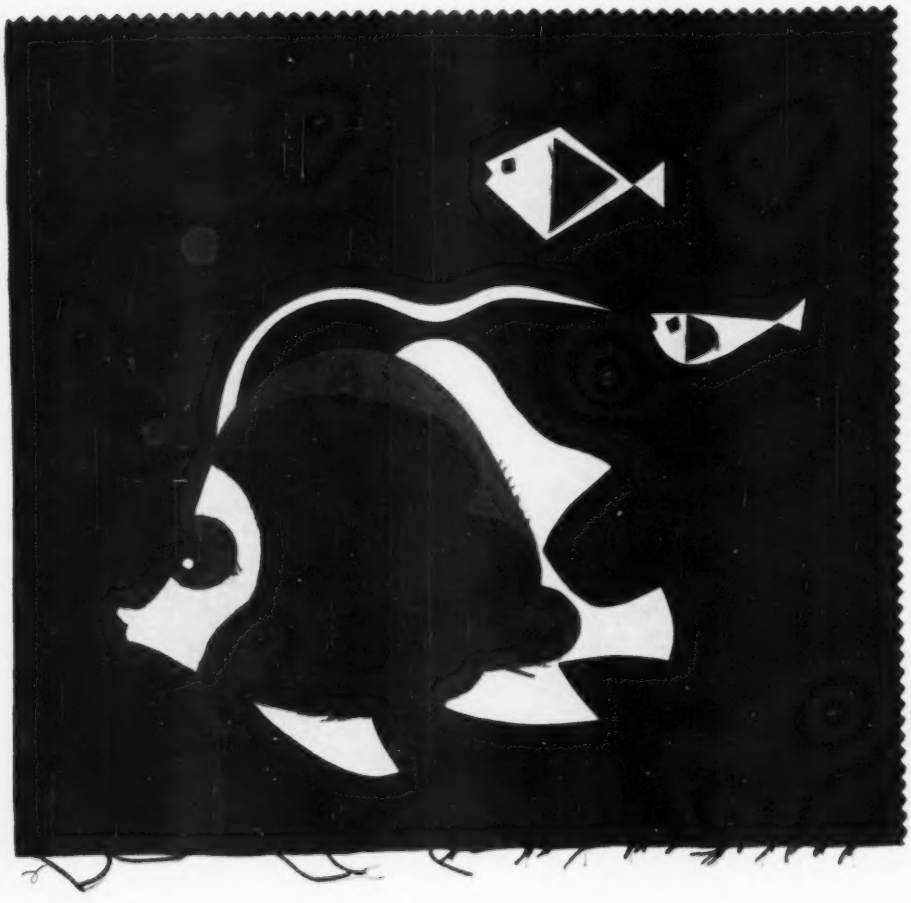
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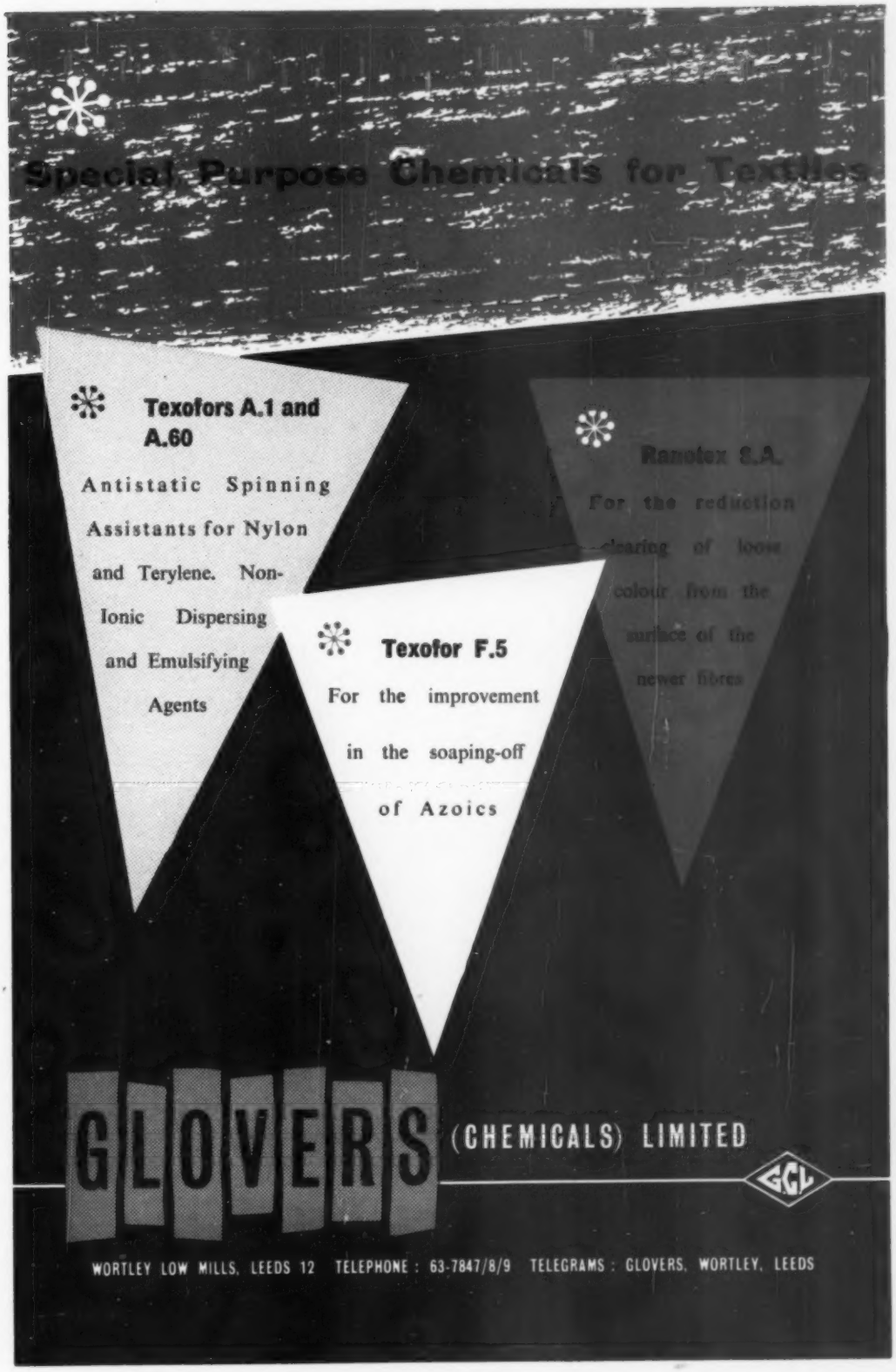
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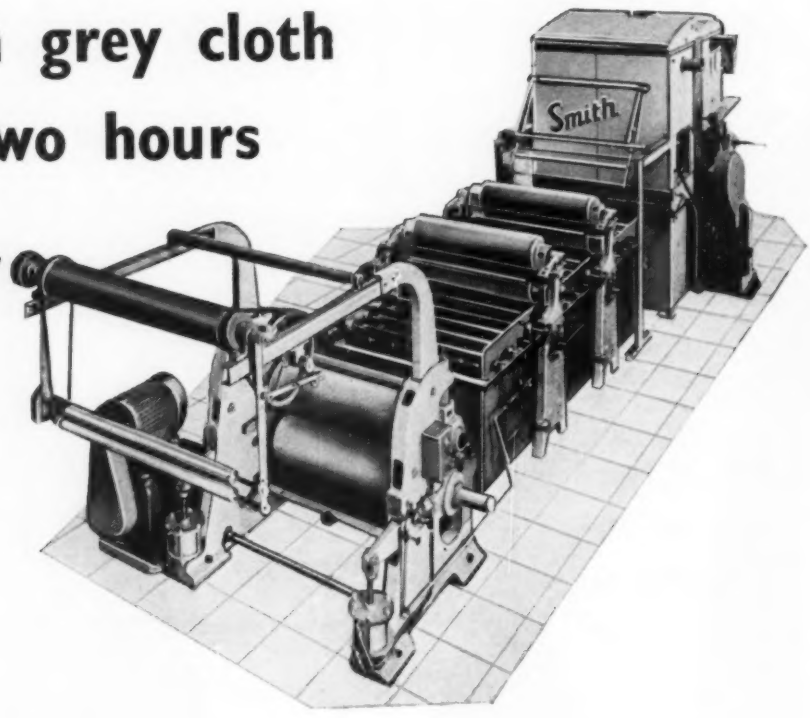
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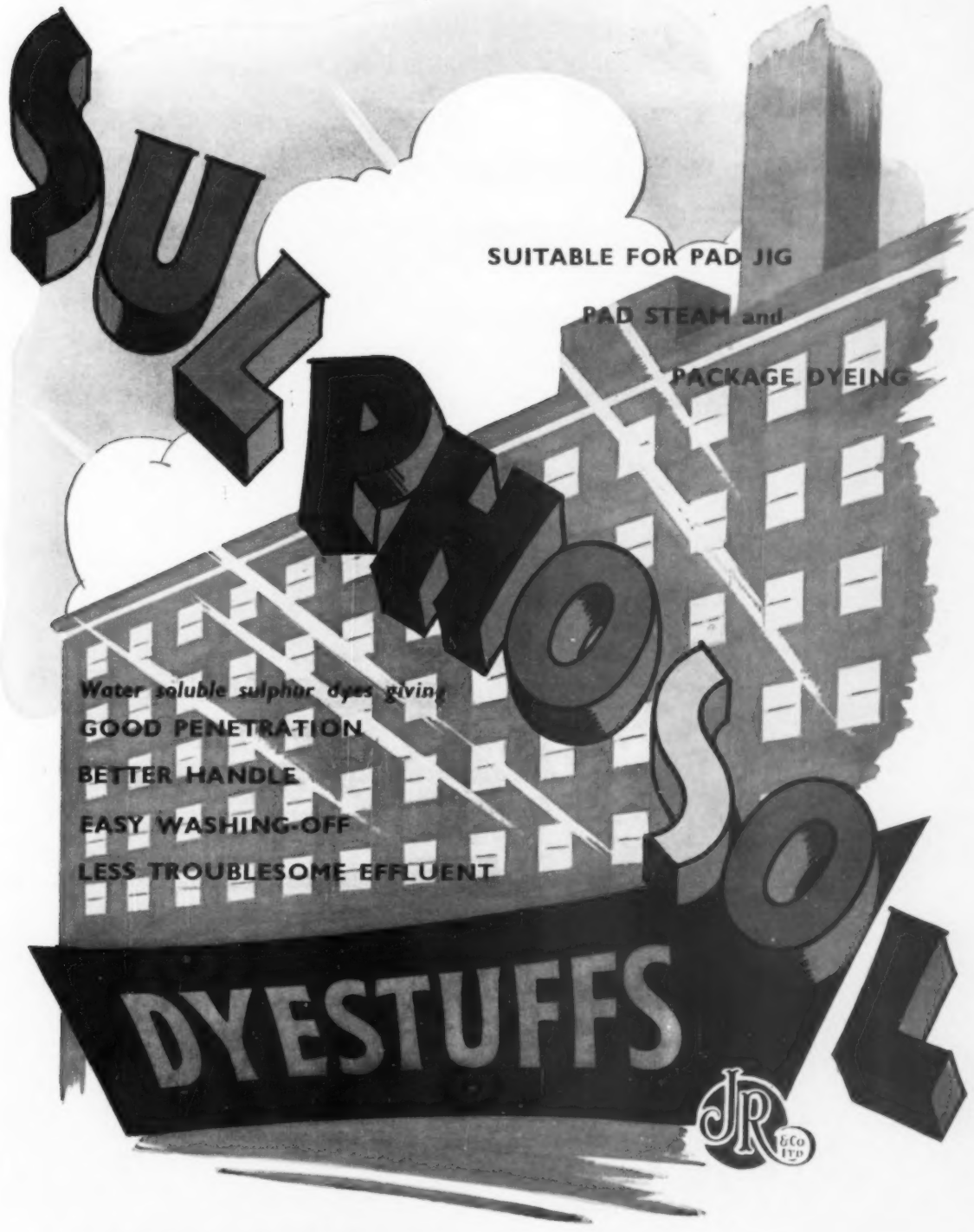
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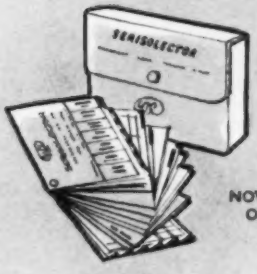
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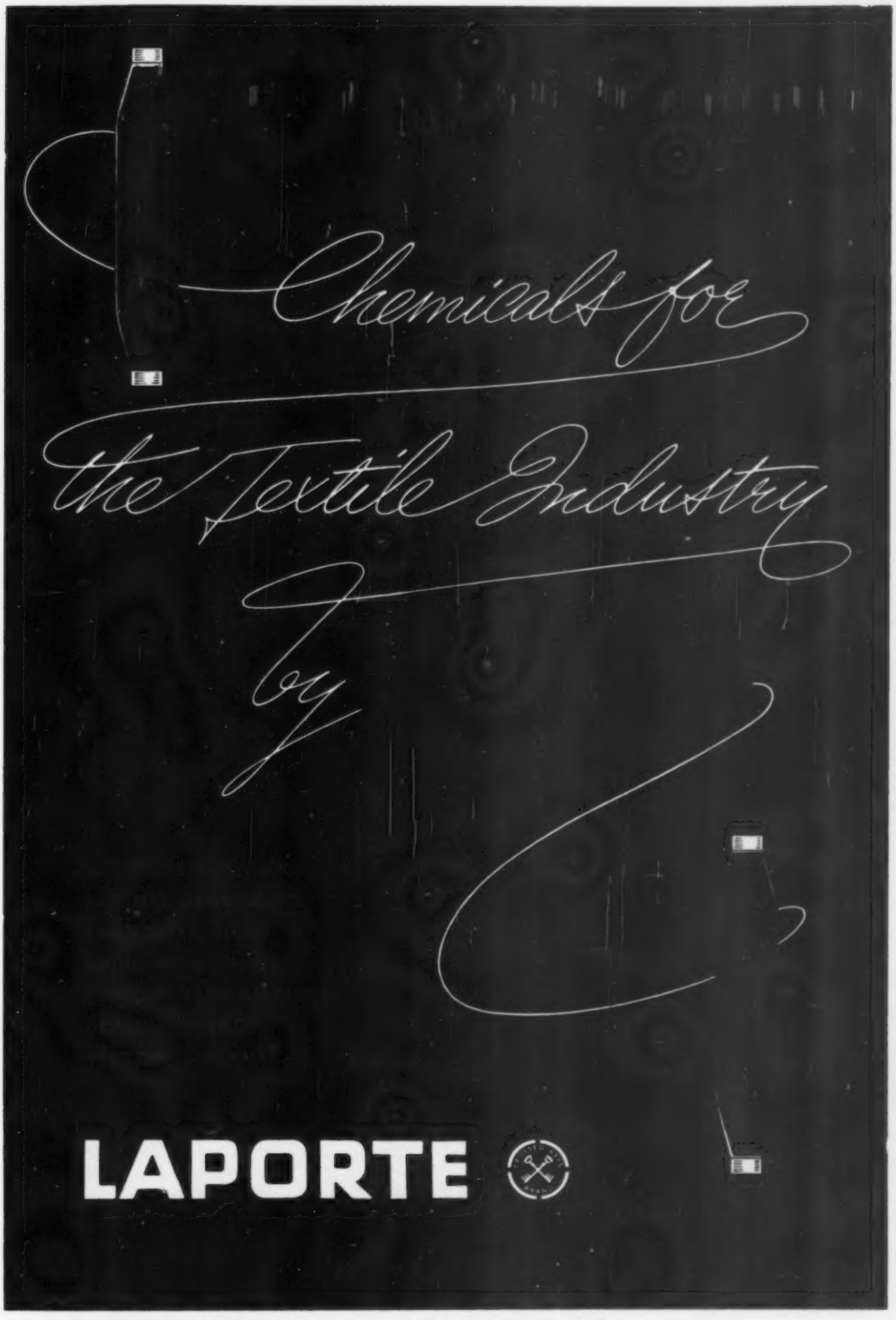
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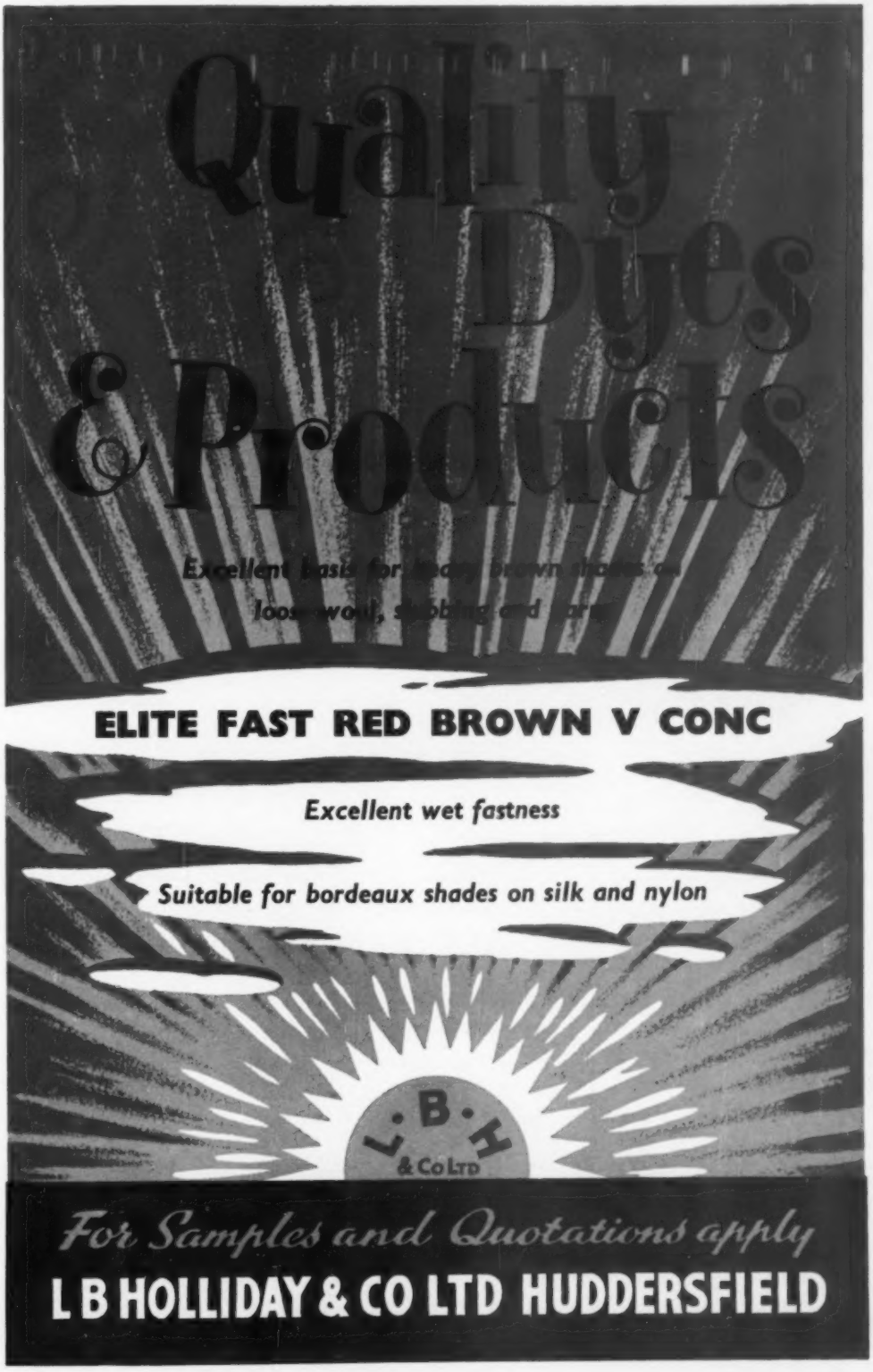
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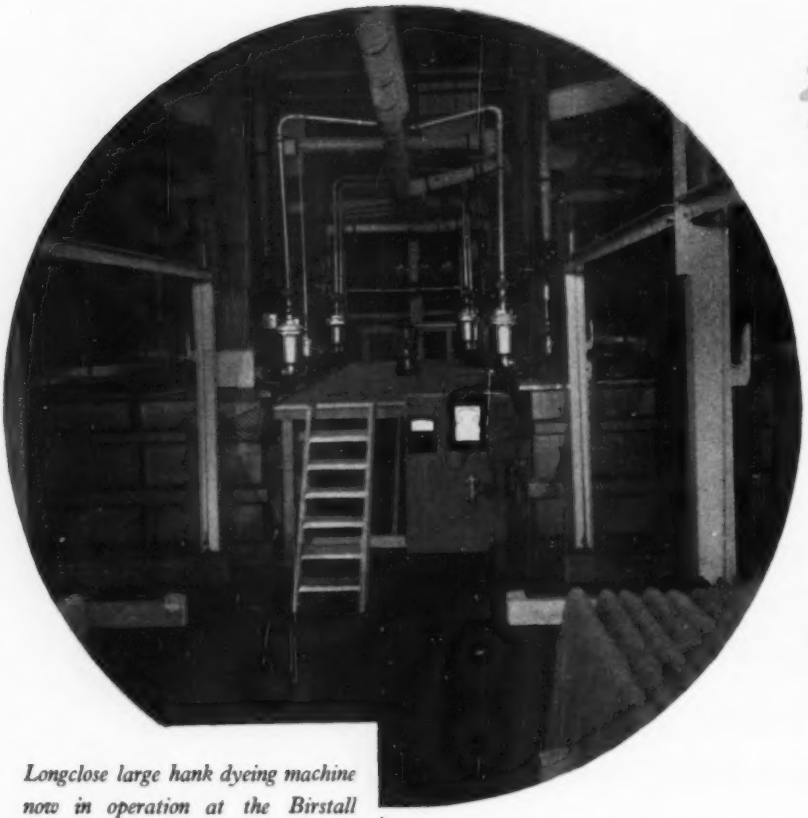
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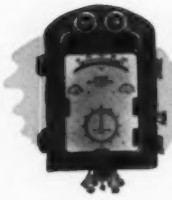

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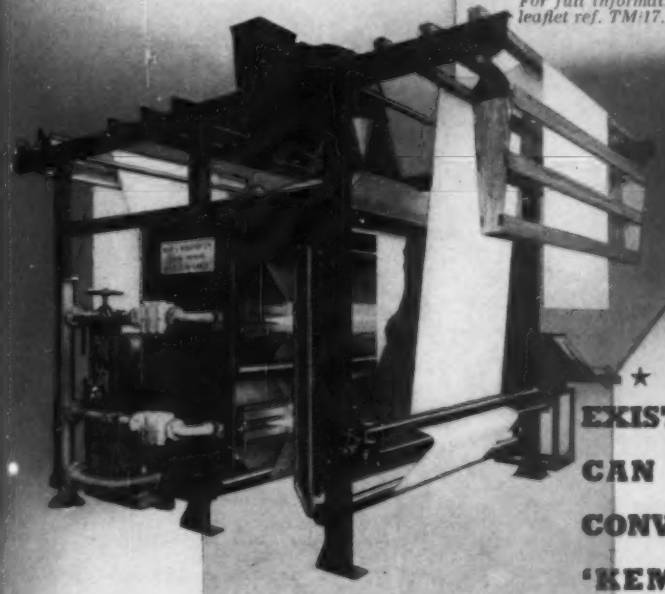
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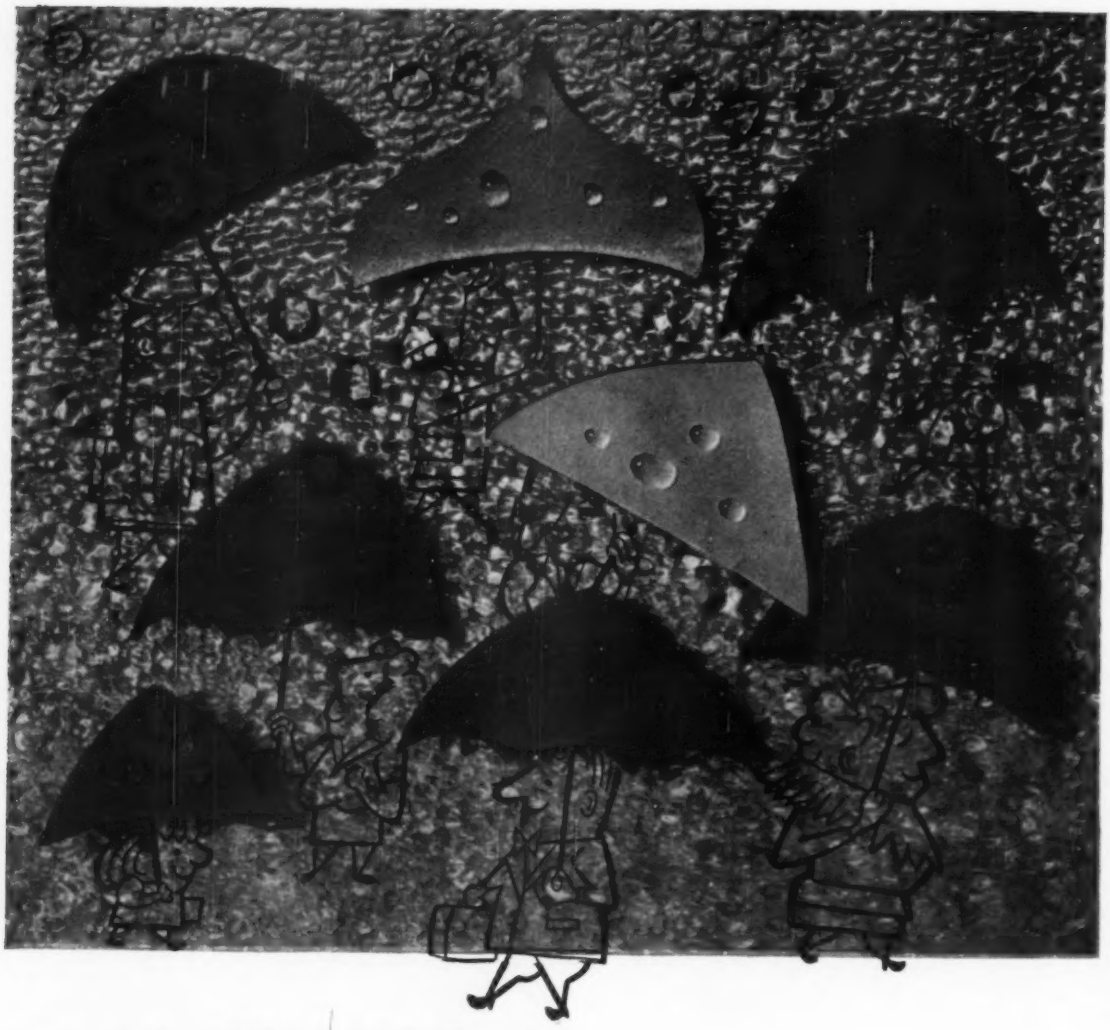
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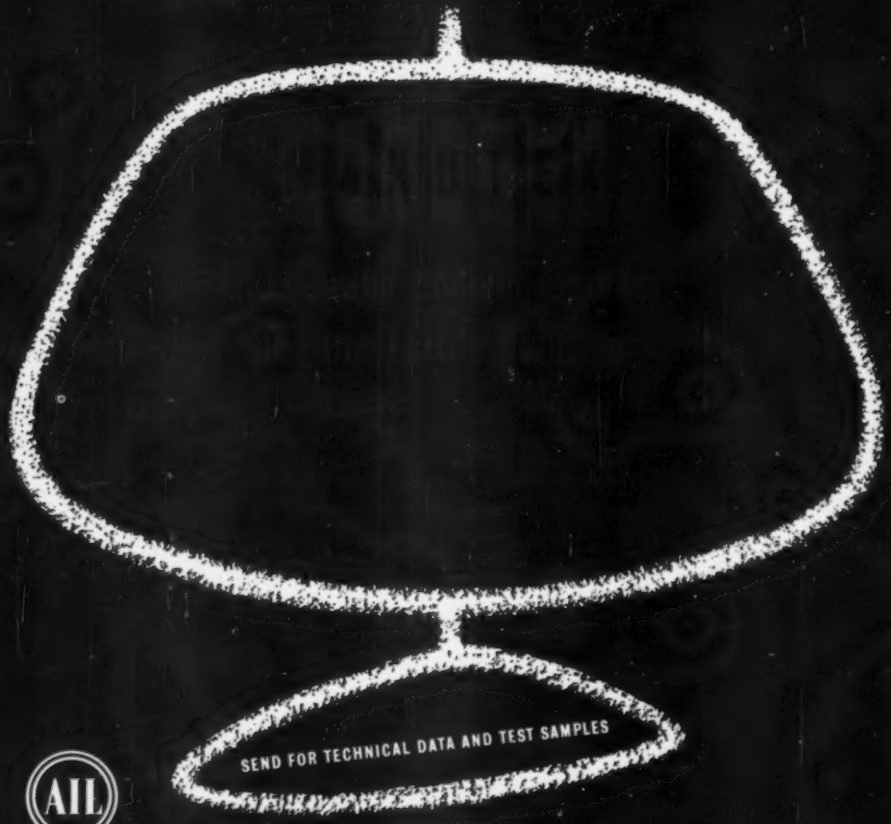
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ARMS *Tierçe in pairle reversed purpure or and azure in chief a madder plant eradicated gold and a slip of indigo leaved and fructed also azure and in base, between two slips of the grain tree leaved also gold, a hexagon argent voided of the field.*

CREST *A purple iris flower proper.*

SUPPORTERS *On the dexter side a female figure representing the Goddess Iris, habited argent with wings or, and holding in the exterior hand a caduceus proper and on the sinister side a male figure representing a craftsman of the dyer's trade in seventeenth century habit, also proper, holding in the exterior hand a hank of silk also or.*

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Town End Chemical Works Limited

Färberei-, Druckerei- und Appreturschule Krefeld

In 1883 the "Krefelder Webeschule" entered new buildings, in which a department of dyeing and finishing was set up, so that the name of the school was changed to "Kgl. Webe-, Färberei- und Appreturschule". In 1895 the dyeing and finishing school acquired its own building and became independent. Since 1935 the dyeing and weaving schools have been united with other, newly formed departments as the *Textilingenieurschule Krefeld*. The dyeing school, which in October 1958 celebrates seventy-five years of work, is now attended by some two hundred students; while another ninety attend the unique Department of Paints and Lacquers, which has now been in existence for thirty-five years.

European Production of Dyes

The O.E.E.C. headquarters in Paris has stated that the Dyestuffs Working Party of the Chemical Products Committee met under the chairmanship of M. François Brichet (Switzerland) to review the situation. In 1957 the output of dyes in the O.E.E.C. countries reached the record figure of 124,000 tons, 11% higher than in the previous year. Imports and exports of dyes also increased in 1957, but proportionately less than production. A fall in consumption is expected in 1958.

Hungarian Dye and Fibre Production

It is planned that the present Hungarian production of about 1000 tons of synthetic dyes annually is to be increased to 6000 tons by the erection of a new factory in Budapest (*Silk and Rayon*, **30**, 665 (June 1958)). Production of Perlon (6-nylon) was expected to begin in August at the new plant at Nyergesujfalu.

Testing of Food Additives

The second report of the Joint Food and Agriculture Organisation–World Health Organisation Expert Committee on Food Additives, entitled *Procedures for the Testing of International Food Additives to establish their Safety for Use*, is obtainable from the F.A.O. headquarters in Rome. It gives guidance on methods of biological testing, toxicity studies, interpretation of the evidence, and research on procedures used in assessing the safety of food additives, presumably including colorants.

Centre de Recherches de la Bonneterie

The first issue of the quarterly *Bulletin du Centre de Recherches de la Bonneterie* (pp. 96) was published earlier this year. The French hosiery industry comprises more than 1,500 undertakings with a total of 80,000 employees, or an average of only about 50 workers, and for this reason the Fédération Française de Bonneterie encouraged the setting up of a research centre for the whole industry. The Centre will occupy two buildings, one rectangular and the other triangular, at 270 rue du Faubourg Croncels, Troyes (Aube). Meetings are held every month, at which technical problems facing the industry are discussed.

Apart from details of the organisation of the Research Centre, various technical papers mostly reproduced from other journals, and abstracts of patents, this issue of the *Bulletin* contains the first instalment of a useful vocabulary of technical terms in French, German, and English. The Centre will endeavour to maintain close relations with similar foreign research organisations, particularly those at Milan, Nottingham, Reutlingen, and Tournai.

Coloured Shirts for Safety

Workers employed on the construction of a research centre at Syracuse N.Y. wore shirts of different colours according to the degree of hazard of their occupation, e.g. electrician (blue), steelworker (orange). It was hoped that the ready recognition of a man's trade resulting from the selection of eight colours to fit a safety code would help to increase efficiency and reduce the accident rate among building workers.

Production of Man-made Fibres in Japan

Statistics relating to Japanese production of man-made fibres are published by the Japan Chemical Fibres Association in *Japan Chemical Fibres Monthly* (**11**, 1–6 (July 1958)). In 1957 the total production of synthetic fibres was 93·5 million lb., the main items being nylon 48·8 and vinylon 32·5 million lb. Rayon filament yarn amounted to 268·1 and rayon staple to 698·9 million lb. During January–May 1958 the production of polyester fibre was 0·51 million lb., but none was produced during 1957. The bulk of Japan's exports of man-made fibres went to Asia including the U.S.S.R., but in 1957 Africa took rather more Japanese spun rayon fabric than did Asia, and European countries, including the United Kingdom, imported appreciable quantities.

6-Nylon from Nitroparaffins

It is reported (*Ind. Eng. Chem.*, **50**, 19A (June 1958)) that a pilot plant is being considered for the production of hydroxylamine from primary nitroparaffins, which are manufactured by the vapour-phase nitration of saturated hydrocarbons. Hydroxylamine, used in making 6-nylon, is at present obtained from sodium nitrite, sodium bisulphite, and sulphur dioxide.

Wear—Usure—Verschleiss

A new "international journal on fundamentals of friction, lubrication, wear, and their control in industry" has commenced publication under the above title (Amsterdam: Elsevier Publishing Co.), the editor being Dr. G. Salomon of the Centraal Laboratorium T.N.O. in Delft. Although the first paper, by Dr. D. Tabor of Cambridge, deals with the *Friction, Lubrication and Wear of Synthetic Fibres*, most of the papers are concerned with the

friction and wear associated with metallic surfaces, and are thus of only indirect interest to most readers of this *Journal*. However, the frictional properties of high polymers are assuming increasing significance, and the resulting electrostatic effects present many problems in textile engineering. Moreover, wear is, of course, an important aspect of textiles, and colour fastness is not an entirely unrelated subject.

"Do-it-yourself" Vat Dyeing

The *American Dyestuff Reporter* (**47**, 67 (27 Jan. 1958)) contains a description of the Sani-Vat (AAP) dye kit, designed for use by hospitals, hotels, and other institutions. It is claimed that with normal institutional laundry equipment dyeing can be completed in about an hour, and can be useful for such purposes as the colour coding of sheets, etc. for laundering and storage.

Durable Pleating of Wool

The Si-ro-set process, devised by the Commonwealth Scientific and Industrial Research Organisation in Australia, is now available for use in the United Kingdom. The cloth is sprayed with a dilute solution containing essentially ammonium thioglycollate and then set with steam. The solution is sold under licence in this country by Albright & Wilson (Mfg.) Ltd. of London, Robinson Brothers Ltd. of West Bromwich, and Toni Cosmetics of Brentford.

Coloured Stainless Steel

According to *Industrial and Engineering Chemistry* (**50**, 19A (June 1958)) the Electro Metallurgical Co. has developed a process in which the pigment in a suitable vehicle is applied by spray or roller coating to specially prepared surfaces, and the coating is then baked.

New Books and Publications

The Sources of Invention

By John Jewkes, David Sawers, and Richard Stillerman. Pp. xii + 428. London: Macmillan & Co. Ltd. 1958. Price, 31s. 6d.

This book is probably the first detailed examination of the origins of technical creativeness in modern times. The authors have examined objectively the rôles in present-day society of the individual inventor on the one hand and of the research organisation on the other.

Their general conclusions are based on detailed case-histories of some sixty modern inventions. These histories, which alone make fascinating reading, take up more than one-third of the volume and cover inventions as diverse as the ball-point pen, the cyclotron, the helicopter, the jet engine, magnetic recording, radar, rockets, and the zip fastener. Of particular interest to chemists may be mentioned the descriptions of the origins of the following, selected at random— Cellophane, crease-resisting fabrics, new fibres, D.D.T., Freon refrigerants, penicillin, polythene, silicones, stainless steels, streptomycin, synthetic detergents, Polaroid sheet, tetraethyl-lead, and titanium.

Some of the facts revealed are familiar ones, at least to readers of this *Journal*, but many are unfamiliar and surprising, and some indeed are startling. Most of the key inventors of the eighteenth and nineteenth centuries worked as individuals. It is widely believed that many of them were unacquainted with science; this, the authors show, is an entirely wrong belief: they were, it appears, as closely in touch with current scientific developments as are inventors today. Further, it is often assumed that large industrial firms are now entirely responsible for the bulk of important inventions; yet the facts reveal that, while many important recent inventions have originated in the laboratories of large and progressive organisations, many others have been the work of individual inventors, often using simple equipment.

The authors speak of the commonly held belief, "rarely formulated precisely, but ever present . . . that mass production will produce originality just as it can produce sausages", but "Over-lavish equipment and attempts to release the research worker from the use of his hands and eyes can easily consume or blunt those very mental powers upon which innovation depends". The great resources of the large industrial corporations are, however, essential in most cases, but not in all, for the full development and exploitation of new products or processes, good examples being the Kodachrome film and nylon and Terylene fibres.

Recent events have aroused great public concern over the supply of scientists and technologists, and the organisation of research in the Western world. The present volume comes at an opportune time to remind us that a vital factor in our civilisation is the creativeness and imagination of our scientists and technologists rather than their number or manner of organisation. This factor can develop and flourish to the full only in a free society— it is significant that every one of the inventions described originated in the Western world, and that none apparently was originally the product of the planned research of an authoritarian government, though some were exploited in such quarters.

This is an important and unusual book. It is admirably written, telling a deeply interesting story with clarity and freshness of approach. It should be in the hands of everyone who feels a responsibility for the future of civilisation.

C. H. Giles

Conference Terminology

A Manual for Conference-members and Interpreters in English, French, Spanish, Russian, Italian, German

Edited by Jean Herbert. Pp. xv + 147. Amsterdam: Elsevier Publishing Co. (London: Cleaver-Hume Press Ltd.). 1957. Price, 12s. 6d.

This is the first volume of *Glossaria Interpretum*, a series of multilingual glossaries sponsored jointly

by the École d'Interprètes de l'Université de Genève, the Auslands- und Dolmetscherinstitut der Johannes Gutenberg-Universität Mainz, and the Institute of Languages and Linguistics, School of Foreign Service, Georgetown University, Washington D.C. The general editor of the series, M. Jean Herbert, is a former Head Interpreter to the United Nations, and each volume is compiled by a group of experts who are native speakers of the different languages, so the accuracy of the terms employed would appear to be guaranteed, though a few minor errors have been noticed.

In the present volume some 750 terms are grouped under six headings—types of meetings, preparation of the meeting [*sic*], documents, composition of a conference, votes and elections, and debates—and then indexed alphabetically in the different languages. It should thus be of considerable value to those who are concerned with the organisation of international conferences and committees. A brief perusal of this book shows some interesting equivalencies; and also cases where translation would be superfluous. Thus "to maintain order in the hall" is in French *assurer la police de la salle*; and the term "pool" seems to be used in several languages for a typewriting service.

Volumes in this series are in course of preparation on such technical subjects as coal and atomic energy, and it is to be hoped that eventually glossaries of this type will appear more directly concerned with the fields of interest of the Society.

C.J.W.H.

Small Firms with Big Problems

A short account of an experimental Technical Liaison Service run by the Scottish Council (Development and Industry)

Information Division D.S.I.R. Pp. iii + 24. London: Department of Scientific and Industrial Research. [1958.] Gratis.

This booklet is an outline of the full findings and statistical evidence available in *Report on a Survey of Small and Medium Engineering Firms in Scotland with special reference to their Needs for Information and the Flow of Information* (Edinburgh: Scottish Council). A team of three investigators, all men retired from responsible posts in industry, visited 109 firms to ascertain what problems confronted them and how they attempted to find solutions. Among sources of information, literature appeared to be the chief means of keeping in touch with developments, but other firms and suppliers were the principal solvers of problems, and research societies came very low on both lists. Firms without qualified staff tended to make less use of outside resources, and even those which subscribed to research associations did not always realise how the latter could help. It was noteworthy that in many cases mere discussion with an outside expert helped to clarify existing problems and bring to light new problems.

The problems encountered were grouped into five broad categories—technical design, technical production, organisational commercial, organisational production, and finance problems. During the survey 265 sources of information were approached for solutions to 223 problems, and in one case 40 letters were written; answers to over 70% of the problems were found from existing information.

It was concluded from the survey that firms were relying predominantly on trade contacts and other firms, and thus were in danger of operating within a closed circle. Absence of long-term plans to meet changing circumstances was largely due to lack of technical information on which they could be based. Written publicity from research bodies was a quite inadequate substitute for personal contact, and a permanent technical liaison service would be of considerable value. It also appeared that there was often a failure of communication within sources, so that not all the information they possessed could be readily passed on to enquirers.

The above conclusions relate to a different technology in a special geographical region, but no doubt they have important lessons for the industries with which the Society is associated.

C.J.W.H.

Annual Reports on the Progress of Chemistry for 1957

Volume LIV

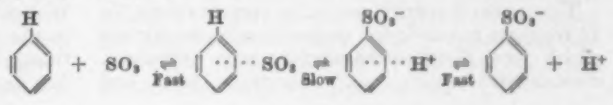
London: The Chemical Society. 1958. Pp. 445. Price, 40s. 0d.

The subject-matter of this Report is treated under five main headings—

General and Physical Chemistry—The topics concerned are dealt with under *Radio-frequency Spectroscopy*, *Electrochemistry*, *Kinetics of Chemical Change* (explosions and flames are excluded, but polymerisation and radiation chemistry are included), *Thermochemistry*, and *Dielectric Measurements* (particularly for hydrogen-bonded systems, phase transitions, polymers, and adsorbed molecules).

Inorganic Chemistry—Here, the pattern of last year is followed, namely, a systematic discussion of the main groups of the Periodic Table, the treatment of the transition elements being introduced by some general aspects of co-ordination chemistry; there is also a summary of recent applications of ligand(or crystal)-field theory.

Organic Chemistry—A review of recent theoretical developments commences this section, and attention is drawn to various articles and books dealing with the mechanisms of organic reactions, including steric effects, the properties and methods of identification of transient intermediates, and the applicability of the Hammett and related acidity functions to chemical problems. Later, particular consideration is given to aromatic substitution and to nucleophilic displacements at a saturated carbon atom, since these subjects were not discussed last year. It is of interest that the sulphonation of benzene by aqueous sulphuric acid when investigated kinetically by an isotope-dilution technique appears to follow the reaction scheme—



Important contributions to the study of azo-coupling reactions are recorded, and when 4-chlorodiazobenzene is coupled with 2-naphthol-6:8-disulphonic acid, a large isotope effect and catalysis by bases are observed. Conformational analysis receives special attention in the section on stereochemistry, and the effects of neighbouring aryl groups in nucleophilic displacements have led to the isolation of some interesting *spiro*-dienones. A warning is given that the common method of destroying excess of lithium aluminium hydride with ethyl acetate may lead to an explosion if there are local concentrations of the solid reagent. The potentialities of the lithium–ethylenediamine system as a reducing agent have revealed that aromatic compounds are reduced to *cyclo*paraffins and mono-olefins, and indicate the system to be the most powerful and least selective reagent of this type yet described. Methyl sulphate reacts readily with magnesium in tetrahydrofuran at 15–20°C. to give excellent yields of the reagent $CH_3MgSO_4CH_3$, which behaves like the conventional Grignard reagent and may often be more advantageous owing to the lower volatility of the methyl sulphate. The striking observation has been made that benzene is partially isomerised to fulvene by ultraviolet irradiation. The direct introduction of the diazonium group into aromatic nuclei by the action of nitrosating agents, e.g. nitrosylsulphuric acid, or the nitrogen trioxide–boron trifluoride complex, has been developed into a reaction of preparative value. Interesting possibilities are opened up by the preparation of a series of diazonium salts containing long-chain alkyl groups, e.g. 4-*n*-decyloxybenzenediazonium toluene-*p*-sulphonate, which are soluble in benzene.

BIOLOGICAL CHEMISTRY— The four major fields of enzymes, amino-sugars, purines and pyrimidines, and antibiotics are considered, and the outstanding rôle of isotopic methods is emphasised.

ANALYTICAL CHEMISTRY— The wealth of papers now available has necessitated a break with tradition, and attention is concentrated only on original papers and new principles. Of these, a rapid method for the accurate determination of water and alcohols in acetic acid, acetonitrile, ethyl acetate, acetone, benzene, and carbon tetrachloride deserves mention; it is based on titration with acetic anhydride in the presence of perchloric acid, using the red ferric hydroxamate colour reaction for external end-point detection.

The Report includes author and subject indexes which relate to 3484 references, and will be a most welcome addition to the chemist's library.

H. H. HODGSON

'AnalaR' Standards for Laboratory Chemicals
incorporating improved standards for the Analytical Reagents originally designated as 'A.R.'

Formulated and issued jointly by The British Drug Houses Ltd. and Hopkin & Williams Ltd. 5th edition 1957. Pp. xvi + 397. Poole and Chadwell Heath. Price, 21s. 0d.

This revised edition contains specifications for 14 reagents not included in earlier editions, among which are diaminoethanetetra-acetic (ethylenediaminetetra-acetic) acid, disodium salt, and sodium metaperiodate. Specifications of 12 reagents included in the fourth edition have now been discontinued, and among these may be mentioned benzidine, Dimethyl Yellow, diphenylbenzidine, Methyl Orange, Methyl Red, phenolphthalein, and sulphosalicylic acid. Some rearrangement has resulted from the adoption of *Recommended Names for Chemicals used in Industry* (*B.S.* 2474:1954). It is of interest that *p*-toluidine is now assayed by titration with 0·1N. perchloric acid in glacial acetic acid.

The detailed descriptions of the various tests for impurities and methods of assay for the various reagents should be of considerable interest to those concerned with precise chemical analysis.

C.J.W.H.

The B.D.H. Book of Organic Reagents

The British Drug Houses Ltd. 10th edition 1958. Pp. vi + 182. Poole: B.D.H. Laboratory Chemicals Division. Price, 18s. 0d.

Only 48 reagents are described in this latest edition, compared with 71 in the ninth edition published in 1946, because several reagents have been found to be unsatisfactory and also the book deals mainly with quantitative uses. Many absorptiometric methods are given, and references are listed for each reagent. Although most of the tests are for inorganic ions, many of the reagents are either colorants or closely related organic compounds. Determinations which may be of special interest to readers of this *Journal* are those of cellulose and starch with anthrone, titanium with chromotropic acid and with cupferron, *α*-amino acids with indanetrione hydrate, and amino compounds and nitrites with *N*-1-naphthylethylenediamine dihydrochloride. Under each reagent are given its general properties and uses, qualitative tests (if any) and quantitative tests with full experimental detail, including information on interferences and how to eliminate them.

C.J.W.H.

Zur Nomenklatur der Textilhilfsmittel, Lederhilfsmittel, Gerbstoffe und Waschrohstoffe

By Wolff Scheer. Pp. 53. Frankfurt a. Main: Verbandes der Textilhilfsmittel-, Lederhilfsmittel-, Gerbstoff- und Waschrohstoff-Industrie e.V. 1958. Gratis.

Vocabulaire des Surfactifs ou Agents de Surface

NF T 73–000. Pp. 4. Paris: Association Française de Normalisation. 1957. Price, 175 francs.

The German booklet has been prompted by the requirements of the customs and excise authorities, and classifies speciality chemicals under the application headings given. Its aim is to clarify the nomenclature of the products, and in 37 categories, again based on use, the textile specialities are listed and these applications defined. Whilst the definitions incline more to the legal than to the scientific side, they are commendably well thought out, and if they appear simple to those familiar with the functions which these products

perform, that is not to say that customs officials and statisticians will not find them very valuable. For students there is a good deal of concise information in the booklet. Of course, some terms are used which are quite untranslatable, the most outstanding being *Färbeöl*, frequently rendered by Continental authors as "dyeing oil". This is given as a dyebath wetting agent having a softening effect on the goods, as distinct from levelling agents having a similar effect. Apart from such isolated examples, the text of the definitions is clear— surprisingly so in such a complicated field— and the information is expressed so concisely as to put to shame the authors of several textbooks on speciality chemicals who have already, it is true, covered the same ground but with considerably greater expenditure of space. In many cases also, broad indication of constitutions is given. Leather specialities are classified under 16 application headings, and tanning materials under 9.

Interest in the classification of the present mass of specialities is evident also in France. The French standard, however, starts more fundamentally with definitions of surface activity and surface-active agents, although one cannot expect in such a short space much explanation. Some general knowledge of physical chemistry is presupposed. Definitions of anionic, cationic, non-ionic, and ampholytic agents are given, prior to dealing with explanations of their functions in application. In this section some very fine points are drawn, and definitions given for the phenomena of cleansing and wetting (detergency, wetting) and the effects of the operations of the phenomena (detersion, wetting-out). These, incidentally, place a severe strain on technological English (but perhaps not on technological American). In one case the phenomenon and the effect are covered by the same term— synergistic effect and its alternative synergesis.

Both brochures represent good preliminary approaches in their respective languages to the difficult problem of the nomenclature of speciality chemicals.

S. R. COCKETT

200 Years Geigy

Basle: J. R. Geigy AG. [1958.] Pp. 127. Gratis.

Although this publication is in paper covers, its length and general style of production entitle it to the technical description of commemorative book. It is, of course, intended to publicise Geigy and Geigy products. It is the kind of publication which is first looked through with casual interest and then read from beginning to end. For that reason, and because it is eminently readable, it may fairly be regarded as good publicity. It begins with an account of the rise and development of industry in Switzerland. It may surprise some to learn that the Swiss cotton industry was at one time second only to that of Britain. It transformed an agrarian country into an industrial one. As in Britain, chemical industry was an offshoot of the textile industry, but Switzerland's handicap was always the paucity of natural raw materials. Basle, always an important trading point, the centre of the Swiss ribbon industry, and situated close to the frontiers with France and Germany on the upper Rhine, is peculiarly suited to a concentration of chemical industry. We read of the origin of Geigy in 1758 as merchants of drugs and natural dyestuffs, and of the firm's development into a manufacturing concern in 1833, when it set up its own dyewood mills. Like so many other manufacturers, Geigy were early in the field of synthetic colouring matters with Verguin's Magenta, discovered in 1859.

Geigy's chemical products are divided into five groups— dyes and tanning materials, general chemicals and pigments, pesticides, pharmaceuticals, and (in Britain) plastics chemicals. The book deals with the groups in turn and gives concise and palatable accounts of their manufacture in each group.

It is as well to be reminded that Traugott Sandmeyer joined Geigy as a chemist in 1888, and that the firm owed much of its strength in wool dyes to his efforts. It is a little surprising that Geigy's greater debt to Peter Griess was not mentioned. There are reminders enough. Griess died in that same year of 1888, and the bicentenary of Geigy's foundation is at the same time the centenary of Griess's discovery of diazo compounds, upon which so much of Geigy's prosperity is built. Still, personalities do not enter into this book. What matters are the ranges of manufactured products, and these will particularly interest those who can see them against the larger background of the rise of synthetic dyes throughout Europe as a whole.

In the chapter devoted to pesticides, D.D.T. is naturally dealt with fully; its phenomenal success has made of it a household word even among those with the vaguest knowledge of Geigy's many other products.

After this description of the firm's products, which is by no means a dull catalogue, the book tells how the Geigy Group, with its twenty subsidiaries throughout the world, came into being. It ends with a chapter on the relation of the firm to the employee, and touches on welfare services, education, pensions, recreation, and the like, which are not greatly different from those of other chemical concerns. At least, it shows that Geigy are no less aware of their importance than any other firm.

This is a book which will interest British readers. Geigy is not just a Swiss firm: it is an important part of British industry, going back close on forty years, with factories in Manchester and elsewhere. The bonds between Britain and the Swiss chemical industry are, however, older than the book suggests. The debt owed to Swiss chemical industry during the desperate days of the First World War is not forgotten. The Swiss were then reliant upon Germany for raw materials, and were left in no doubt about what would happen if they sold their products to the Allies. Nevertheless, they aided the Allied cause by taking our intermediates and converting them into dyes for our own use when the need for them was great indeed.

The book is profusely illustrated by seven colour photographs and eighty in black and white. That we are not always told what the photographs are intended to illustrate is no great matter. The text is in three languages— German, French, and English— but the press work could have been better. The type is pleasing, but the scant lower margins give an unfortunate impression of the printed matter slipping down off the page. A trilingual publication no doubt has its own difficulties, and the book is still a very well conceived piece of publicity.

W. H. CLIFFE

Printing and Litho Inks

By H. J. Wolfe. 5th edition 1957. Pp. 489. New York: MacNair-Dorland Co. Price, $9.25 or 72s. 0d.

Until the Second World War the printing-ink industry lagged sadly behind in technical advances when compared with the printing trade in general. Today, as a result of the availability of many new synthetic materials, the industry has more than caught up. It can now offer tailor-made inks to meet any requirement, and even suggest new methods of printing to the printers.

In keeping with these technical strides, H. J. Wolfe has found it necessary to revise and bring up to date *Printing and Litho Inks*. The aim of the book is to give junior technicians entering the industry a picture of the many types of inks that are made, and to present, in as concise a manner as possible, the fundamental principles of ink-making. This it does very well, but it tends to deal more with the technical rather than with the theoretical aspects of the subject.

The first chapter is given over to a historical survey, which is followed by a general discussion of the characteristics of printing inks. As the author points out, a knowledge of the properties of the raw materials is essential for the proper formulation of inks. To this end, therefore, he devotes eleven chapters to this aspect of the subject. To give an example of the scope, there are chapters on printing-ink vehicles, solvents, pigments, resins, driers and drying, ink compounds, and addition agents. Chapter III, on ink vehicles, has been expanded to include safflower oil, epoxy, and gelled ink vehicles. Chapter VIII, on organic pigments, is brought up to date by the inclusion of the Naphthol Reds and the daylight-fluorescent colorants; similarly, Chapter X, on resins, now includes the styrenated alkyds, cyclised rubber, polyethylene, and cellulose derivatives.

The next section of the book deals with the formulation of typographic, planographic, and intaglio inks. Each chapter is divided into subsections which describe the process, how it is carried out, and the type of ink required to fulfil the special conditions. Typical formulations are given to illustrate the point, but the author could have revised these with advantage to demonstrate the use of modern synthetic resins. In Chapter XVII the newer types of inks formulated mainly from synthetic resins are reviewed, but no formulae are given. The discussion on flexographic inks has been completely rewritten and enlarged. The last section of the book includes chapters on the physical properties of inks, factory equipment, and a useful chapter on ink troubles and remedies.

There are few typographical errors. However, the "Pitch Varnish" formula (p. 262) is no longer "on the next page", because of the new layout. Also, in the formula on p. 302 the "54 lbs. 0 oz. 3 Transparent varnish" should read *54 lbs. 0 oz. C.P Medium Chrome Yellow Dry*. The volume is attractively bound, but unfortunately the printing leaves much to be desired. It is felt, too, that if all the formulae were put at the end of each subsection a neater result would be obtained.

In this edition it is obvious that Wolfe has thoroughly revised his material, and that he has even pruned his original phrases to give a clearer presentation. The book is well worth a place on the bookshelves of printer and inkmaker alike.

L. J. WATKINSON

Absorption Spectrophotometry

By G. F. Lothian. 2nd edition 1958. Pp. viii + 246. London: Hilger & Watts Ltd. Price, 52s. 0d.

In the nine years which have elapsed since the first edition of this book, there have been far reaching developments in the technique and instrumentation of absorptiometry. The second edition, which is much larger, reflects this expansion, particularly in its treatment of photoelectric spectrophotometers, which are comprehensively described and analysed. For the reader who is concerned with applications of absorptiometry to dyes in solution and on fibres, however, there will be a lack of specific information, although the analysis of mixtures of absorbing substances in solution is very well dealt with.

Photoelectric colorimetry is not discussed, since, strictly speaking, it does not come within the scope of the title, but the book would have been of greater interest to members of the Society if it had been included. There is an excellent bibliography covering absorptiometry in the ultraviolet, visible, and infrared regions.

E. ATHERTON

Der Wollstoff-Appreteur

By Karl-Heinz Schicktanz. Pp. 97. Heidenheim/Brenz: Verlag Alfred Halscheidt. 1957. Price, DM 7.80.

The purpose of this little book is stated to be to survey for the apprentice the wet and dry finishing of wool and union materials, and with its detailed descriptions of working processes and practical hints to help the experienced finisher in his daily work. A glance through the book shows that the emphasis is largely on machinery, which is profusely illustrated, and the absence of chemical formulae testifies to its essentially practical nature. The main subjects discussed are— burling and mending, scouring, singeing, water, milling, carbonising, setting, special finishes, drying, raising, steaming, pressing, decatising, shrinking, and perching.

C.J.W.H.

Optische Aufheller
("Farblose Fluoreszenzfarbstoffe") Grundlagen—Eigenschaften—Anwendungen

By E. Ühlein. Archiv-No. 892, S.K.B. No. 2/1791. Pp. i + 86 + ii. Garmisch-Partenkirchen: Moser-Verlag, Fachliteratur-Ermittlungs- und Berichtsdienst. 1957. Price, DM 30.00.

This publication appears to be a very useful survey of the literature on fluorescent brightening agents. Complete coverage is expressly disclaimed, but *Chemisches Zentralblatt* and *Chemical Abstracts* have been fully covered up to 1956 (issues No. 27 and 13 respectively), yielding 124 references to papers and 494 to patents. A commendable feature is that the author states quite clearly which references have been consulted in the original, and which only as abstracts.

It is stressed that the essential effect of these substances is a brightening ("Aufhellen"), not a bleaching, and the various synonyms used to denote them in German, English, French, and Dutch are given (a notable omission here is *produit d'azurage optique*). The light emitted must be polychromatic, since the excited electron returns to the ground state in unequal steps.

A brief historical review refers to a patent as early as 1911 for the use of coumarin derivatives as ultraviolet absorbers, but interest in the use of fluorescent whitening or brightening dates essentially from the 1930s. The different clerical classifications of these agents are given, and then each group of compounds is considered separately. Twenty-eight constitutional formulae are grouped on two pages, and it appears that such agents must have at least four conjugate double bonds. The various physical, chemical, fastness, and physiological properties are discussed, and applications are reviewed. Among noteworthy special applications are the prevention of discoloration in peeled potatoes, apples, etc., the whitening of anodised aluminium, gel formation in polyvinyl alcohol solutions, the production of green fluorescence in lubricating oils, and the prevention of rancidity in edible oils and fats by incorporation in the wrapping paper.

A section on analysis and evaluation is followed by tables of commercial names, firms owning patents, related patents, and concentrations required.

C.J.W.H.

A Vocabulary of Technical Terms used in the Textile and Related Industries
English–French English–German French–English German–English

Imperial Chemical Industries Ltd. Pp. 103. Manchester: ICI Dyestuffs Division. 1958. No price.

It was an excellent idea to publish this pocket-size vocabulary with the different language pairs printed on paper of different colours for easy reference. It is not easy to pass judgment on its value without using it for a prolonged period, and an assessment is made more difficult by the absence of any preface indicating its purpose and any principles which may have guided the selection of terms. It is evident that a vocabulary of some 700 terms cannot form a comprehensive textile dictionary, especially as several more general terms, e.g. "steel" and the names of the colours, are included. Notable omissions, on which help was sought, are the German textile terms *Scheuerfestigkeit* and *krumpfecht* and the French word *manutention*. Another noteworthy omission is the term "carrier", but perhaps this was intentional, as there is still a certain fluidity regarding the use of this term. The gender of German nouns is indicated, but not that of French nouns, surprisingly.

C.J.W.H.

The *Textile Recorder* Annual 1958–1959
Book of the Year

Manchester and London: Harlequin Press (1955) Ltd. [1958.] Pp. 172. Price, 30s. 0d.

This publication provides a useful conspectus of events and progress in the textile industry during 1957. The trade reports relate especially to the United Kingdom, and show that, even for the Lancashire cotton industry, 1957 did not compare unfavourably with 1956, and was characterised by the development of new chemical finishes for cotton. Progress in bleaching, dyeing, and finishing is reviewed by A. J. Hall, who deals notably with reactive dyes and the use of epoxy resins. Five well illustrated pages are devoted to dyeing and finishing machinery, including a machine for dyeing and finishing hose in a single continuous process, mangles of improved design, new types of cylinder driers, and a Czech finishing calender.

C.J.W.H.

De Bichromaatbeitsing en de Kleurbaarheid van gebeitst Lipoid onderzocht met behulp van Reflectometrie
met een discussie over de Photometrie van Kleurstofvlekken

By Frans J. M. Heslinga. Pp. 173. Leiden: Rijksuniversiteit te Leiden. 1957. No price.

This thesis, submitted for the degree of M.D. in the University of Leiden, consists of two parts, with a summary in English (pp. 150–155). The first part describes a study of the chemistry of the mordanting of lipoids in histological materials with potassium dichromate, based on an investigation of model systems containing certain unsaturated lipoids. The staining of such mordanted materials with acid Hematein was studied in detail. It is suggested that the oxidation product is an extensive three-dimensional network consisting of polymerised triglycerides and chromium complexes, the process of formation of such alcohol-insoluble pigments as the lipofuchsines being analogous to the drying of unsaturated oils.

The second part of the thesis is concerned with working out a reflectometric method for estimating the amount of dye formed in a spot test. Both the amount of light reflected and the dimensions of the spot had to be taken into account, and the mathematical treatment was complicated by the fact that the incident beam overlapped the spot, so that some white light was reflected by the

unstained paper. The densitometer employed was calibrated by means of coloured "object wedges" of angle α, the value of cot α serving as a parameter for the concentration of dye. Stained histological sections were fixed to filter paper, and then measured in the same way as a coloured spot.

C.J.W.H.

New Books received

Universal Decimal Classification. Trilingual (Abridged) Edition. (German–English–French). B.S. 1000B: 1958. (F.I.D. No. 277). London: British Standards Institution. Pp. 515. 126s. 0d.

Layout of Periodicals. A Guide for Editors and Publishers. B.S. 2509:1954. London: British Standards Institution. Pp. 20. 3s. 6d.

Amendment No. 1, published 13 June 1958, to B.S. 1006: 1955. Determination of Fastness to Daylight of Coloured Textiles. London: British Standards Institution. Pp. 3.

Manufacturing, Dyeing, and Finishing Defects in Broad Woven Fabrics— Their Cause and Cure. Textile Monograph No. 4. 1958. Quebec Section: Canadian Association of Textile Colourists and Chemists and the Textile Society of Canada (Eastern Division). Pp. viii + 2 plates + 145. $2.00.

Oral Communication of Technical Information. R. S. Casey. New York and London: Reinhold Book Division and Chapman & Hall Ltd. 1958. Pp. vii + 199. 36s. 0d.

Modern Carpet Manufacture. A. Crossland. Manchester: Columbine Press. 1958. Pp. vii + 176 + 15 plates. 21s. 0d.

The Dyeing and Finishing of Half Hose and Other Footwear. A. Datyner. Bradford: The Society of Dyers and Colourists. 1958. Pp. v + 23. 7s. 6d.

The Sources of Invention. J. Jewkes, D. Sawers, and R. Stillerman. London: Macmillan & Co. Ltd. 1958. Pp. xii + 428. 31s. 6d.

Arts and Crafts of Japan. No. 2— Textiles. T. Yamanobe. English adaptation by Lynn Katoh. Rutland, Vermont and Tokyo: Charles E. Tuttle Co. 1957. Pp. 70 + 22 colour plates. $3.00.

Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes. Any publication abstracted may be referred to by members of the Society on application to Dr. C. B. Stevens, Dyeing Department, Leeds University

Badische Anilin- & Soda-Fabrik AG.

Indanthren, Anthra and Brilliant Indigo Dyes. Direct Printing on Cotton— This card (German text only) contains prints in two depths on cotton cloth of 45 Indanthren vat dyes, 2 Anthra dyes, and 5 of the Brilliant Indigo type. The text describing the properties and application of the dyes and the fastness characteristics of the prints runs to 78 pp., is bound separately in stiff covers, and slips conveniently into a pocket in the pattern card proper.

Ciba Ltd.

Cibacet Blue GF— This disperse dye gives blues of good fastness to light, sublimation and gas-fume fading on secondary cellulose acetate, triacetate, and polyester fibres. It is not recommended for polyamide fibres as it has a lower fastness to light on this fibre. Fastness figures on secondary cellulose acetate include— Light (daylight) (bright fibre) 7, sublimation 4–5, gas-fumes (3 cycles, AATCC) 5.

Cibanone Grey F3G— This vat dye gives greenish-greys of very good fastness to light and wet treatments on cellulosic fibres. It covers dead cotton and viscose rayon of irregular dye affinity. It is particularly recommended for shirtings on account of the excellent fastness of dyeings to chlorine and peroxide bleaching. Fastness figures on cotton include— Light 7, soda-boiling (*a*) + chlorine (*b*) 4 redder, sodium chlorite bleaching 3–4.

Cibaneutrene Orange FR— This stabilised azoic combination is recommended for direct printing on cellulosic fibres, alone and alongside a wide variety of other types of dye and for coloured resists under solubilised vat dyes and Aniline Black. Very bright yellowish oranges are obtained by developing in neutral steam, acid steam, by dry heat or in a wet operation. Fastness figures on cotton include— Light 4–5, chlorine ECE (*b*) 4–5, washing ECE (*c*) 5.

Cibacron Dyes in Yarn Dyeing— This card contains dyeings in four depths on mercerised and unmercerised cotton yarn and continuous-filament and spun viscose rayon yarn of seven reactive dyes of the Cibacron range. In addition there are eight mixture dyeings on mercerised cotton and eight more on filament rayon. Full application details are given and comprehensive data on the effect on the hue and light fastness of dyeings of aftertreatment with Lyofix CH and resin-finishing with Ureol P.

The Latest on Cibacron Dyes— As the title suggests, this publication gives information, in loose leaf format, of developments in the field of reactive dyes. Details are provided of the first black in the range— Cibacron Black BG; new instructions for printing and dyeing; special fastness properties, including mercerising, chlorinated water ECE; behaviour of dyeings in finishing, particularly with crease-resist finishing with Ureol P and Lyofix CH. A most interesting section describes a method of applying selected Cibacron dyes to wool to give dyeings of excellent wet fastness and brilliance of hue. The method consists essentially of dyeing at pH 6–7 using a conventional procedure— commencing at 50°c., raising to 100°c. during 30 min. and dyeing at 100°c. for 30–90 min.— followed by raising the pH to 7 by adding ammonia or hexamethylene tetramine and continuing dyeing for 15 min. with the steam shut off when using ammonia and 20–30 min. at the boil with hexamethylenetetramine. The object of this final stage is to promote reaction of dye and fibre and to eliminate dye which has not chemically combined with the wool and would otherwise reduce the overall fastness of the dyeing. The Cibacrons listed are of interest used alone and in two-dye mixtures. The behaviour of three-dye mixtures and the production of fashion colours is still being investigated.

Bright Reds on Wool with Cibacron Dyes— This card contains dyeings on wool yarn and cloth using Cibacron Brilliant Orange G, Scarlet 2G, and Brilliant Red 3B. The accompanying text gives full details of application which is as described in the previous publication. Details are also given for using Cibacron dyes for Vigoureux printing, in particular Cibacron Black BG. The colours obtained are fast to potting and acid cross-dyeing. It is claimed that most satisfactory results have been obtained in bulk trials on slubbing, knitting yarn, carpet yarn, cloth and knitted goods. The chief advantages claimed are exceptional brilliance of the reds, levelness, very good fastness properties, and a simple and speedy method of dyeing which at the same time preserves the quality of the wool. Fastness figures for the recommended dyes fall within the following limits— Light (Xenotest) 5 to 6–7, alkaline milling ECE (*b*) 4–5 to 5, potting ECE 4 to 5.

Ciba Clayton Ltd.

Anionic Dyes for Dyeing Filament Nylon— Lists are given of anionic dyes which are "relatively insensitive" and "slightly sensitive" to physical variations in filament nylon and which are considered should be the first choice when level dyeing is of paramount importance. The information has been abstracted from the paper published by H. W. Peters and J. C. Turner, British Nylon Spinners Ltd., Pontypool, entitled *Investigations into the Dyeing of Continuous-filament Nylon with Disperse and Anionic Dyes* (J.S.D.C., **74**, 252 (April 1958)).

CIBACET DYES ON COURTELLE— This card contains dyeings in two depths on Courtelle yarn of nineteen disperse dyes. This type of dye is useful for producing pale to medium depths on this fibre and of special interest for the knitwear trade. A supplement gives an assessment of the staining of wool during dyeing and details of the recommended acid permanganate—bisulphite clearing treatment.

DEORLENE DYES ON COURTELLE— Dyeings in two depths on "Courtelle" slubbing of eleven modified basic dyes of the Deorlene range are included in this card. Retarder A Ciba is recommended as a restraining agent particularly when producing medium depth dyeings. This class of dye is of interest for full, including very bright, colours on this acrylic fibre as used in all trades, including knitwear and suiting, because of the good fastness of the dyeings to light and severe wet treatments.

Courtaulds Ltd.

CARRIER LB— This carrier is recommended for dyeing triacetate fibre with disperse dyes. A marked increase in rate of dyeing is obtained and a particular feature is that the fastness characteristics of the dyeings are unaffected by its use as are also the properties of the fibre itself, in particular pleatability and pleat-retention. It is marketed as a pale-coloured, self-emulsifying oil containing 25% of active agent. It is non-toxic and relatively non-volatile and does not condense under the covers of machines with consequent risk of spotting. It must not be used with azoic dye components and dyeings produced in presence of it must not be treated with chlorine or chlorine-liberating compounds. A range of dyeings produced on the jig and in the winch, with and without carrier, are included.

Farbenfabriken Bayer

ACRAMIN BLACK FPV— This addition to the Acramin range of pigments for resin-bonding to textile materials meets the demand for a black having satisfactory fastness to solvents and polyvinyl chloride plasticisers. The overall fastness characteristics of the FPV brand are the same as the old FBRK brand. Fastness figures include—Light 7–8, washing (100°C.) 4–5, chlorine 5, benzine 5, trichloroethylene 5, carbon tetrachloride 5.

NAPHTOL AS–FGGR— This azoic coupling component produces bright greens on cellulosic fibres in combination with numerous bases and salts including Fast Orange RD, Scarlet GG, Red TR, and Bordeaux BD. The brilliance of the dyeings and prints is unequalled by any other azoic combinations in this colour range and their fastness properties are very good. White and coloured discharges of a number of combinations based on this coupling component are possible. Fastness figures for the combination with Fast Red Salt KBA on cotton include—Light 6, washing (203°F.) 5, chlorine 1, boiling soda (*b*) 4.

PHTHALOGEN TURQUOISE IFBK— This addition to the Phthalogen range of phthalocyanine dyes is very similar to the Brilliant Blue IF2GK brand and is suitable for producing bright turquoise blues on cotton. It is of interest for direct printing alone and alongside all groups of dyes and is notable for the stability of its print pastes and its non-sensitivity when printed alongside vat dyes and Aniline Black. It is particularly suitable for resists under Aniline Black and Variamine Blue. The "Indanthren" fastness label may be applied to all materials printed with this colour and intended to be used for curtains, furnishings, dress materials and articles to be repeatedly laundered. Fastness figures for a print on cotton include—Light 8, boiling soda 4–5, washing (203°F.) 4–5.

Farbwerke Hoechst AG.

FAST VIOLET F BASE: FAST VIOLET SALT F— This azoic base and the corresponding salt give deep violets of good fastness on cellulosic fibres particularly when used in conjunction with Naphtols AS–BS, AS–D, AS–E and AS–TR. Azoic combinations based upon it are of special interest for resist and discharge printing styles. Fastness figures for a dyeing on cotton using Naphtol AS–BS—Light 5, washing (95°C.) 5, chlorine 5.

INDANTHREN BLUE HCBG— Blues of good fastness to light and soda-boiling–hypochlorite bleaching are obtained on cellulosic fibres. Bright blues are obtained on silk but it is not recommended for curtains and furnishings. It is also of interest on polyamide fibres, an interesting feature being the very good fastness to light obtainable in full depths without steaming the dyeings. Fastness figures on cotton include—Light 7, kier boiling 5, chlorine (*a*), (*b*) 5.

INDANTHREN COPPER HR— Clear reddish browns are obtained on cotton. The hue on regenerated cellulose is much yellower. Brands suitable for pigment dyeing and padding are available. Fastness figures on cotton include— Light 6, kier boiling (with Ludigol) 4, chlorine (*a*), (*b*) 4–5.

SCREEN PRINTS WITH INDANTHREN DYES (COLLORESINE PROCESS)— This card contains prints in two depths on cotton cloth of twenty-six Indanthren dyes applied by the Colloresine process in which dye and thickener only are printed on to the material. Fixation is brought about by subsequent padding with a Rongalite-potash solution and steaming. Since this need not be carried out until required the dyes printed on the cloth have unlimited stability and the method is of particular value when printing is carried out by hand (screen, block, spray, and warp printing).

REMAZOL DYESTUFFS FOR PRINTING AND DYEING— This card contains full details for applying this new group of reactive dyes to cellulosic fibres by pad-dyeing and printing. Six dyes are described: Remazol Yellow G, Yellow RT, Red B, Red Violet R, Brilliant Blue R and Black B. In addition, a number of patterns are included taken from bulk pad-dyeings and printing. The general application procedure consists in printing or padding with a paste or solution containing dye, urea and sodium bicarbonate, drying and steaming. As with the other ranges of reactive dyes it is essential to remove uncombined dye after steaming, in order to develop maximum wet fastness. The dyes may also be printed alongside vats, solubilised vats and azoic combinations. All are dischargeable to white and, with the exception of Brilliant Blue R, may also be used for coloured discharges. They can be resisted using either acid or reducing media and excellent results can be obtained under aniline black. These effects are illustrated by samples from bulk printing. Fastness figures on cotton include—

	Light	Washing (75°C.)	Perspiration
Yellow G ...	5–6	4	5
Yellow RT ...	7	4–5	4–5
Red B ...	3–4	5	5
Red Violet R	6–7	5	5
Brilliant Blue R	7	4–5	5
Black B ...	5	5	5

J. R. Geigy AG.

IRGANOL ORANGE GRLS— This is an addition to the Irganol S range of neutral-dyeing acid wool dyes and is recommended for use alone and in combination with other members of the range and of the Irgalan range of neutral dyeing metal complex dyes where dyeings of good fastness to light and wet treatments are demanded. Orange GLRS is also of interest for dyeing polyamide fibres and silk. White discharges are obtainable on silk (Hydrosulphite Z water-soluble) and on wool (Hydrosulphite FDW). Fastness figures for a dyeing on wool include—Light 6, washing (*b*) 4, severe milling 4.

SOLOPHENYL BROWN 3RL— This direct dye gives very reddish browns on cellulosic fibres. It is very level dyeing and the wet fastness properties of dyeings are improved by aftertreatment with Tinofix A or LW. Solid dyeings are obtainable on cotton/viscose rayon mixtures. Fastness figures for a dyeing on cotton include— Light 6–7, washing (*a*) 2 (aftertreated with Tinofix LW, 3–4).

Imperial Chemical Industries Ltd.

PROCION DYES FOR COTTON TOWELLING— This class of dye is particularly suitable for colouring this type of material. Ten dyeings are included produced with either single dyes or mixtures on bleached cotton towelling on the jig using cold-dyeing members of the range. The "H" brands are not recommended for batchwise dyeing. Recommendations are also given for application by a continuous pad-dry process.

PROCION DYES FOR COTTON KNITWEAR— This card contains twelve dyeings produced on unbleached material on the winch using selected cold-dyeing Procion dyes (with the exception of Brilliant Blue H7G), the "H" brands not being generally suitable for batchwise dyeing. Fastness figures fall within the following ranges— Light 5 to 6–7 (exception— Turquoise 4–5), severe washing (5× at 100°C.) 2 to 3–4, perspiration (histidine) 4 to 5.

PROCION DYES FOR COTTON SHEETINGS— This card contains twelve dyeings representing typical pastel colours used for sheetings. The recipes have been based on cold-dyeing Procions rather than on the "H" brands which are not generally recommended for batchwise processing and dyeing was carried out on the jig. Details for pad–jig development application and continuous dyeing by the pad (bicarbonate)–dry method are also given. Fastness data appended show that a fastness of 5 or better to light, 4 or better to repeated severe washing and 4 or better to perspiration may generally be achieved.

PROCION DYES ON VISCOSE RAYON TUFTED CARPET— This card contains dyeings on 100% viscose rayon staple, cut-pile, jute-backed carpeting of five cold-dyeing Procion dyes dyed on the winch and a further ten dyeings illustrating typical brown, beige, rust, red, green and grey colours demanded on this type of material. A simple cold-dyeing batchwise technique is described but these dyes are very suitable for application to "tufted" carpet staple and fabric by continuous methods using either the pad–dry, pad–steam or pad–batch principle. It is recommended that the dyed material be aftertreated with Cirrasol AR to promote resistance to soiling.

MODE SHADES ON CELLULOSE TRIACETATE— This card contains fifteen dyeings on continuous filament cellulose triacetate cloth dyed on the jig. In all cases, except one, disperse dyes have been used. The exception is a black dyed with the azoic combination, Dispersol Diazo Black B300 + Brenthol OT, applied in presence of 10% of diethyl phthalate as carrier. Full details of the dyeing characteristics of each individual dye and the fastness properties of the dyeings obtained are given in the now standard loose-leaf format.

MODE SHADES ON ACRILAN FIBRE— This card contains fifteen dyeings on Acrilan yarn. All, except one dyed with Croceine Scarlet 3B, have been produced with disperse dyes which are very suitable for dyeing cloth and yarn, although the dyeings obtained on loose fibre and slubbing are considered to be insufficiently resistant to severe wet treatments. Full details of the dyeing behaviour and fastness characteristics of each dye are given, an interesting feature being the presentation of two sets of figures for fastness to daylight, one set for patterns exposed at Wilmslow, Manchester and the second at Bombay.

PROCION DYESTUFFS IN TEXTILE PRINTING— A third binder has now been issued to accommodate the revised and enlarged introductory text (52 pp.) which supersedes that issued in 1956 and also all the Technical Information Leaflets (Dyehouse) from No. 309 to 404 relating wholly or in part to the application of Procion dyes in printing.

TECHNICAL INFORMATION LEAFLETS— *Dyehouse No. 421. Procion Dyestuffs: Printing Application without Steaming*— The information in this leaflet supersedes that given in *T.I.* No. 321. Full details are given of four methods of fixing Procion prints without steaming— alkali-padding, high-temperature baking, air-hanging and drying on cylinders (for use with prints on Brenthol prepares). At present six of the more reactive Procions are recommended as suitable for application without steaming.

Dyehouse No. 422. Application of Procion Dyestuffs to Natural Silk (replaces No. 308)— The Procion dyes are recommended for producing dyeings of outstanding fastness to wet treatments on silk. They can be applied to all forms of material and, in addition, cloth may be dyed by a continuous process similar to that used on cellulosic fibres. Details of methods of application and fastness characteristics are given.

Dyehouse No. 423. Dyeing of Terylene–Cellulosic Fibre Unions— Supplement No. 1— A continuous dyeing method using a pad–fix technique is described using disperse dyes for the polyester fibre and reactive dyes for the cellulosic component. The material is padded with a mixture of the dyes, sodium alginate, bicarbonate and urea, dried at 110–120°C. and then heated for 15–60 sec. at 185–190°C.

Dyehouse No. 424. Standard Depths for Fastness Testing (replaces No. 413)— In the interests of international agreement, the Dyehouse Department will, in future, use the ISO Standard Depths described in the official manner and supplemented where necessary by those issued by the German Fastness Commission (DEK) which illustrate $\frac{1}{2}$, $\frac{1}{1}$, and $\frac{1}{12}$ Standard Depth.

Dyehouse No. 425. Dyeing of Blends of Nylon and Terylene Polyester Fibre—When dyeing Terylene–nylon mixtures in which both fibres are to be dyed, disperse dyes have to be used for the Terylene. These dyes also dye nylon. Initially the latter is dyed more deeply but in presence of a carrier at 100°C. or if dyeing is carried out at 125–130°C. the dye is gradually transferred to the Terylene. Procedures are suggested for producing solid and contrasting colours using one- and two-bath methods.

Dyehouse No. 426— Procion Dyes: Printing on Chlorinated Wool and Natural Silk— Direct prints of very good fastness to wet treatment may be obtained on wool and silk, the general methods of application being similar to those used on cellulosic fibres and only relatively short steaming times are required. Gum tragacanth and Celacol MM10 (BrC) are recommended as alternatives to sodium alginate as thickeners when printing wool. Procion dyes are only recommended for printing chlorinated wool. On unchlorinated wool the colour yield is low and prints are uneven in appearance.

Dyehouse No. 427— Printing of Terylene Polyester Fibre: Print–Dry-heat Process— Selected disperse dyes may be printed and fixed on Terylene by baking the printed material for 60 sec. at 180–200°C. and a non-steaming process for printing this fibre is thus available. The suitability of a particular dye is governed by its volatility under dry heat conditions but an adequate range is available and a full range of colours can be obtained using mixtures.

Dyehouse No. 429. Procion Dyes: The Pad (Alkali)— Batch (Cold) Method of Dyeing Cellulosic Piece Goods with the Cold Dyeing Procion Dye— This new process reduces dyeing with this group of reactive dyes to its simplest terms, viz. padding in a cold solution of dye, alkali and wetting agent, batching for 1–24 hr. and washing off. The degree of fixation is good and is reasonably well maintained up to the heaviest depths. It is better than that obtained by jig or winch dyeing. Full details of operating procedure, including the mechanical arrangements, are given.

Dyehouse No. 430. The Pad–Roll Machine (System Rydboholm): The dyeing of Cellulosic Fibres with Direct, Procion and Alcian Dyestuffs— The application of direct reactive and Alcian dyes using the pad–roll method has been studied and lists of the suitable dyes from each group are given. The reactive dyes are considered to be particularly suitable. The "cold dyeing" group can be applied cold or warm depending upon the time and alkali used for fixation. The "H" brands can only be fixed at a higher temperature and require a stronger alkali and a longer time.

Dyehouse No. 431. The Dyeing of Courtelle with Disperse Dyes— The dyeing behaviour of the disperse dyes on this acrylic fibre has been determined and recommended dyes are listed together with the relevant fastness data.

Dyehouse No. 432. Fastness of Direct Dyestuffs to Steam Pleating: Cotton–Wool–Cellulose Triacetate Unions— The requirements to be met by the direct dyes used for the cellulosic component of cotton–wool–cellulose triacetate mixture cloths to be permanently pleated are set out and the fastness data for direct and Fixanol PN aftertreated dyeings of a wide range of direct dyes when subjected to dry steam at 10 lb./sq.in. for 15 min. are given.

Dyehouse No. 433. Procion Dyestuffs: Application of Procion Rubine BS to Cellulosic Materials by Jig Dyeing— This reactive dye may be jig-dyed if trisodium phosphate or soda ash is replaced by caustic soda. It behaves anomalously in aqueous solution compared with other Procions in that an increase in pH leads to increased stability.

Dyehouse No. 434. Caledon Yellow GN: Phototropic Behaviour on Cotton and Viscose Rayon— A very severe and rapid phototropic effect occurs with this dye (C.I. Vat Yellow 1) on cotton when resin-treated and it is not

recommended for use in these circumstances. The same applies to the related solubilised vat dye, Soledon Yellow G.

Dyehouse No. 435. Printing of Viscose Rayon Tufted Carpet: A Survey of Laboratory Methods.

Dyehouse No. 436. The Dyeing of Terylene–Cellulosic Fibre Unions. Supplement No. 2: Continuous Dyeing using Procion "H" Brands— A procedure is described similar to that recommended for the cold-dyeing Procions (see *T.I.* (*Dyehouse*) *No. 423*). The use of the H brand Procions permits in turn the use of a wider range of disperse dyes hitherto excluded because they reacted with the cold-dyeing Procions giving anomalous results.

Dyehouse No. 437. Procion Dyestuffs: Recommendations for Washing-off Printed Patterns— The principles underlying the washing-off process are outlined and the need to use correct conditions to avoid staining is stressed.

Dyehouse No. 439. Emulsification of Oleines— The addition of surface-active agents to oleines is recommended to make the latter self-emulsifying, to reduce static and to expedite removal during scouring. Suitable products and proportions to use are given.

Dyehouse No. 440. Dyeing of Terylene Polyester Fibre–Wool Blended Materials: Supplement No. 1— This replaces *T.I.s* Nos. 318 (U.K. edn.) and 319 (overseas edn.) "Carrier stains" have been shown to be formed by cracking of the emulsion of *o*-phenylphenol with rise in temperature of the dyebath. In the modified method the carrier is added gradually to the boiling bath. A two-bath procedure is normally recommended as faster dyeings are obtained and greater reproducibility achieved.

Dyehouse No. 443. Procion Dyestuffs: The Use of Fixanol PN in Printing— Fixanol PN treatment of printed goods is of value (1) where goods must be piled wet to await drying or further soaping and (2) in providing a method of producing prints of adequate washing fastness although not as high as would be obtained by efficient washing. It must not be applied immediately after dyeing as a harsh fabric of poor washing fastness will result.

Dyehouse No. 444— The Dyeing of Acrilan Acrylic Fibre— Supplement No. 4. A Method of Applying Ultralan Dyestuffs to Produce Dyeings of High Wet Fastness— By aftertreating dyeings of the Ultralan range of strongly acid dyeing premetallised dyes with 1% of Taninol WR200 in presence of 4% of formic acid (85%) at the boil for 30 min. followed by an addition of 1% of tartar emetic and continuing the treatment for a further 15 min. at the same temperature, their wet fastness properties are improved still further. It is suggested that this aftertreatment be made a standard step in the application of this type of dye to ensure maximum fastness in all cases.

Dyehouse No. 447. The Felisol Label— The International Association for the Felisol Fastness Label (I.F.A.) was formed in March 1956, with headquarters in Zürich, its object being to promote interest in coloured textiles of high fastness to light, washing and weathering and to propagate the Felisol label created for this purpose. The members of the Caledon, Durindone, Soledon, Brenthol–Brentamine and Alcian ranges accepted by the I.F.A. are listed. These, together with Carbindone Black B and Soloxan Black SN will be indicated by the symbol [F] following the dye name, with the exception of the azoic combinations. The Felisol label is at present restricted to coloured cellulosic fibres.

Sandoz Products Ltd.

PRINTOFIX— This card contains direct prints in two depths on cotton cloth of twenty-three Printofix colours. This type of pigment is resin-bonded to the fibre using an oil in water emulsion based on Finish EN (a cross-linking agent), Printofix PF55 (binder) and a thickening prepared from Printofix Thickener 3 conc. for reductions. The printed material is dried and baked, 5 min. at 140–150°C. giving the best results. There is no need for steaming, washing or soaping after fixation. Printofix colours can, of course, be applied alongside other classes of dyes, and to many other types of fibres including synthetic fibres, the composition of the printing paste being modified to suit the characteristics of the cloth and the conditions of fixation. Details are also included for producing resists under Variamine Blue and Aniline Black.

Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., **68**, *23 (Jan. 1952), and also, together with symbols and the periodicals abstracted, in the annual index*

I—PLANT; MACHINERY; BUILDINGS

Automation with Process Instruments

W. H. Ridley

Amer. Dyestuff Rep., **47**, P 389–P 393 (2 June 1958)

A plea for an accurate evaluation of the advantages of automation in textile manufacture, with hints on acquiring instrumentation. P.T.S.

PATENTS

Production of Homogeneous, Multi-component Liquid Mixtures, Solutions or Emulsions

Siemens–Schuckertwerke *BP* 801,558

Some of the components are caused to flow through a throttling zone of a valve while others are added to them at a place in the valve at which the velocity of flow of the first components is greater than the velocity of flow at the inlet to the valve. A steam pressure and temperature reducing valve of the type described in *BP* 710,069 is especially suitable for this purpose. C.O.C.

Zinc White (C.I. Pigment White 4)

G. Dudek *BP* 800,104

Apparatus in which controlled discharge of the evolved zinc vapours is readily obtained with retorts which are only open at one face. The scavenging gas is so intensely warmed along its path through the feed pipe that significant reduction of the working temperature in the retort caused by inflowing scavenging gas does not occur. C.O.C.

Plant for Washing Loose Fibres

E. H. Brooks and E. H. Thompson *USP* 2,810,625

A method of using the apparatus described in *USP* 2,683,365. C.O.C.

Package Dyeing

W. S. Johnson *USP* 2,813,416

Means for automatic control of the plant during dyeing. C.O.C.

Flexible Carrier for the Wet Treatment of Cheeses of Yarn

G. Tigges and M. E. Korff *BP* 801,137

The carrier consists of a radially flexible wire shell formed by a single undulating spring bent to provide arms extending throughout the axial length of the carrier. The undulations in at least the end portions of the arms extend in planes radially of the shell so as to prevent axial displacement of the yarn. The ends of the arms at one end of the shell act as radially projecting feet for the carrier. C.O.C.

Obtaining Samples of Fabric from Closed Pressure Vessels

Sir James Farmer Norton & Co. *USP* 2,815,664

A fitting mounted in the wall of the vessel has a slidable tubular member whose inner end is so made that it can cut samples out of the fabric under treatment. A tube with a valve outside the vessel enables the sample cut out to be ejected either by the pressure in the vessel or by pneumatic hydraulic means. C.O.C.

Moulds for Gypsum Crayons and the like

Stadium Chalk & Crayon Co. *BP* 801,974

Apparatus containing a number of moulds continuously tapered throughout their lengths and mounted with their narrower ends at the bottom. Plungers are provided to close the narrower end of each mould and are mounted so that they can be moved upwards to eject the crayons from the moulds. C.O.C.

Continuous Wet Treatment of Cloth
Rodney Hunt Machine Co. *USP* 2,811,351
In a machine where the cloth follows a helical path over upper and lower rollers the speed of the cloth may be greater and the tension in it less than in previous known machines of this type if the upper rollers rotate at a surface speed greater than that of the speed of the fabric passing over them. In addition the axes of the upper and lower rollers are set at angles to one another. This arrangement provides an automatic substantially frictionless feed. C.O.C.

Felting and/or Milling Machine
E. W. Smith *USP* 2,810,183
In machines of the type described in *USP* 2,604,503 felting appears to take place only where the goods are between the pressure rolls and the oscillating roll. A machine is now described in which a greatly increased number of times during which the goods are pressed against the oscillating roll are attained without increase in the number of pressure rolls. C.O.C.

Heat Treatment of Textiles in a Fluidised Bed
British Rayon Research Assocn. *BP* 800,091
The material is led vertically downwards into and then vertically upwards out of a fluidised bed of siliceous sand of particle size 100–200 μ. A guide roller of porous ceramic material with an internal air supply assists in maintaining the bed in a fluidised condition in the space between the ascending and descending portions of the material being treated. C.O.C.

Screen Printing Apparatus
W. P. McCormick *BP* 801,556–7
A continuously operating plant which embodies an endless flexible screen. C.O.C.

Coating Flexible Webs
Patent & Licensing Corpn. *USP* 2,813,506
Apparatus which ensures that coatings of bituminous or like materials are applied to a base sheet as a smooth, uniform film of predetermined thickness. C.O.C.

Doctors for Papermaking and Other Machines
H. E. B. Scott *BP* 800,607

Stain Removal
H. Glaeser *BP* 800,063
A vibrator holds a beater or brush which is connected to a liquid container fixed to the vibrator. The vibrator causes the beater or brush to give about 50 strokes per min. to the stained material. C.O.C.

Compressive Shrinking (X p. 808)
Finishing Tubular Fabric (X p. 808)

II— WATER AND EFFLUENTS

pH-Sensitive Processes in the Wool Industry
H. Zahn and D. Hildebrand
Z. ges. Textilind., **60**, 221–227 (25 March); 279–282 (5 April 1958)
A review article dealing with the rôle played by pH in the storage and scouring of raw wool, carbonising, drying, dyeing, bleaching, milling, shrinkproofing, raising, crabbing, singeing, fellmongering, and rotproofing. J.C.F.

Disposal of Combined Textile-finishing Wastes and Domestic Sewage
G. G. Bogren
Amer. Dyestuff Rep., **47**, P 473–P 476 (14 July 1958)

Treatment of Mixtures of Textile Waste and Domestic Sewage
R. H. Souther and T. A. Alspaugh
Amer. Dyestuff Rep., **47**, P 480–P 488 and P 490 (14 July 1958)

Combined Treatment of Bleachery Waste and Domestic Sewage
J. L. Brown
Amer. Dyestuff Rep., **47**, P 489–P 490 (14 July 1958)

Dispersed-growth Aeration of Cotton-finishing Wastes. II— Effect of High pH and Lowered Air Rate
N. L. Nemerow
Amer. Dyestuff Rep., **46**, 575–576 (12 Aug. 1957)

Pollution Control of New England Interstate Waters (containing Textile-mill Wastes)
J. C. Knox
Amer. Dyestuff Rep., **47**, P 477–P 479 and P 491 (14 July 1958)

Colour Removal from Azo Dye Wastes
G. R. Waitkins
Ind. Eng. Chem., **50**, 91A (June 1958)
Zinc hydrosulphite or zinc formaldehyde-sulphoxylate are equal or superior to stannous chloride (cf. J.S.D.C., **74**, 189 (March 1958)) in reducing colour. A possible objection to their use for this purpose is that residual S compounds in the clarified dye effluent may cause nuisance conditions. W.K.R.

III— CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

Toxicity of Solvents
R. Piper
J. Oil & Col. Chem. Assocn., **41**, 569–576 (Aug. 1958)
The toxic action of chlorinated and hydrocarbon solvents and the methods (insofar as they are known) used by the body to combat their effect, are discussed in some detail. There is a tendency for the Maximum Allowable Concentration of toxic solvents, as laid down by various bodies, to be set lower as time passes though some remain unchanged, e.g. methanol, toluene, and the xylenes. With regard to the development of dermatitis promoted by paint solvents, it is urged that workers should be given basic training at as early a stage as possible, hand cleansing in paint solvents should be prohibited, barrier creams should be available (though they are not to be regarded as a universal panacea), protective gloves should be worn wherever possible, and clean and tidy working must be encouraged. J.W.D.

Toxicity of Pentachlorophenol
D. Gordon
Med. J. Austral., 485 (29 Sept. 1956): *Occup. Safety and Health*, **7**, 98 (1957): *J. Soc. Leather Trades Chem.*, **42**, 290 (Aug. 1958)
Pentachlorophenol and its sodium salt are extensively used as fungicides and weed-killers, and hitherto have been generally regarded as producing no systemic toxic effects. The author reports nine cases, with five deaths, in men who had been exposed to these substances. The characteristic symptoms were thirst, sweating, and abdominal pain and nausea or vomiting, resembling the acute effects of dinitro-*o*-cresol. C.J.W.H.

Annual Review of the Literature on Fats, Oils, and Detergents
M. M. Piskur
J. Amer. Oil Chem. Soc., **35**, 208–225 (May); 288–316 (June 1958)

Solubility of Binary an Ternary Systems of Synthetic Detergents
C. Kortland and P. L. Kooijman
Proc. 2nd Internat. Congress Surface Activity, **4**, 25–34 and 152 (1957)
The "clear point", i.e. the temp. at which the solution becomes clear after cooling until crystallised, was determined for three detergents in solutions containing 7–50% active matter. The influence of Na_2SO_4 on the clear point was also studied. Sodium dodecylbenzenesulphonate (I) showed a rapid increase in clear point with increasing concentration, and with Na_2SO_4 content, whilst a *sec.*-alkyl sulphate (II) and "lorol" sulphate (III) showed little difference in clear point up to 40% and 30% concn. respectively and in the presence of Na_2SO_4 (up to 20% of active content). Mixtures of I and II, or I and III, had greatly improved solubility, with minimum clear points at ratios 45I:55II, and 50I:50III. Information is also provided on the clear points of ternary mixtures of I, II and a non-ionic. W.K.R.

Alginates in the Textile Industry— Salts and Derivatives of Alginic Acid
H. Schulzen
Z. ges. Textilind., **60**, 228–232 (25 March 1958)
The preparation, structure, and properties of alginic acid derivatives are described, and potential applications in the textile industry are described. J.C.F.

Electron-microscope Study of Certain Dispersions of Detergents in Oil

J. B. Peri

J. Amer. Oil Chem. Soc., **35**, 37–41 (Jan. 1958)

Electron-micrographs of certain detergent and soap micelles presumably existing in oil solution are presented. Both "spherical" and rodlike micelles appear to exist in oil. These micelles are apparently 2 molecular lengths in diameter. The rodlike micelles are of variable length, ranging up to over 300 A. It seems likely that in some instances these rods are small linear aggregates of "spherical" micelles. Association of rodlike micelles to form paracrystalline sheaves of long fibres is indicated. These structures apparently maintain fairly uniform spacings of from 80–100 A. between centres of the rods or fibres although the micelles appear to be only about 50 A. in diameter. Aggregation of spherical micelles to form small colloid crystalline regions in large agglomerates is demonstrated. P.G.M.

Calgon as an Additive to Spinning Oils

K. Schuster and A. Franck-Meinzolt

Textil-Praxis, **13**, 503–505 (May 1958)

Tests have shown that the addition of Calgon to spinning lubricants results in a stronger and more uniform yarn. Other advantages claimed—lowering of static charge, improved scourability of oil, sequestering of traces of iron, and increased stability of oil-in-water emulsions. L.A.T.

Effect of the Structure of Some Surface-active Substances on the Foaming Capacity of Aqueous Gelatin Solutions

S. M. Levi and O. K. Smirnov

Colloid J. U.S.S.R., **20**, 179–183 (March–April 1958)

The effect of the structure of the salts, esters, and polyglycerides of alkylphosphinic and alkenylsuccinic acids on the foaming properties of aq. soln. of gelatin has been investigated, and the increase in foaming capacity is given in the following order—acid esters of monohydric alcohols (no foam) $<$ disodium salts (no foam for $R \leqslant C_8$–C_{10}) $<$ acid esters of glycerol (no foam for $R \leqslant C_8$, $m = 1$) $<$ polyglycerides (foaming agents); R = hydrocarbon radical; m = No. of mol. of glycerol. G.J.K.

Recent Developments in Organic Derivatives of Titanium

R. Sidlow

J. Oil & Col. Chem. Assocn., **41**, 577–586 (Aug. 1958)

The use of titanium esters as antioxidants, gelation promoters, and pigment-dispersing aids is discussed, together with a summary of their uses outside the surface coatings field; amongst these latter is their use as low-temperature-curing agents for silicone resins used to produce water- and stain-resistant finishes on textiles. J.W.D.

PATENTS

Detergent

Unilever *BP* 800,710

The lathering properties, particularly the stability of the lather, of many organic synthetic detergents is improved by incorporation of a compound of formula—

$$R{\cdot}CO{\cdot}NH{\cdot}C(CH_2OH)_3$$

(R = satd. Alk of 9–15 C or unsatd. Alk of 9–17 C), e.g. *N*-tris-(hydroxymethyl)-methylamide. C.O.C.

N-Acyl Taurides

General Aniline *BP* 800,827

An aliphatic or alicyclic carboxylic acylating agent of $>$ 7 C (1·2 mol.) is heated, preferably in absence of a solvent, with a compound of formula—

$$R^2HN{\cdot}CHR^1{\cdot}CHR^1{\cdot}SO_3M$$

(R^1 = H or Alk of $<$ 4 C; R^2 = H or hydrocarbon of 1–20 C; M = alkali metal or alkaline earth metal) in an inert atmosphere at 200–320°C. with continuous removal of the water formed during the reaction. Thus stannic acid, lauric acid and *N*-methyl taurine heated together in the above manner yield a product which when mixed with Na tripolyphosphate and soda ash is an excellent detergent for cotton. C.O.C.

Heavy Duty Detergent

Colgate-Palmolive Co. *BP* 800,705

A mixture of an organic synthetic detergent (0·1–2·0 parts by weight) and a water-soluble inorganic polyphosphate (1) is an excellent heavy duty detergent for laundering.

BP 800,706

A mixture of an organic synthetic detergent, a water-soluble alkaline builder salt, e.g. a polyphosphate, and a little of an insoluble wax or wax-like substance in aqueous alcohol is a liquid detergent which does not settle out and is suitable for heavy duty laundry work. C.O.C.

Colourless Detergent yielding a Coloured Solution

Thomas Hedley & Co. *BP* 801,018

Incorporation in a powdered detergent of a dye or pigment of average particle size $< 20\,\mu$ preferably $< 5\,\mu$ no particle being $> 50\,\mu$, does not appreciably colour the detergent but does result in a coloured solution or dispersion when the detergent is added to water. C.O.C.

Polyoxyalkylene Surface Active Compounds

Wyandotte Chemicals Corpn. *BP* 800,159

A mixture of propylene oxide, ethylene oxide and a compound of $<$ 9 C and having 2–6 reactive H atoms is condensed to yield a hydrophilic polyoxypropylene–polyoxyethylene polymer of O:C ratio 0·33–0·40 and mol.wt. $\not<$ 1000. This on further condensation with ethylene oxide yields products having outstanding detergent and surface active properties. C.O.C.

Polymeric Emulsifying and Dispersing Agents

B. F. Goodrich Co. *BP* 800,011

The partial ester–partial alkali metal or ammonium salt or partial amide–partial amine or ammonium or alkali metal salt derivative of an interpolymer of a monomeric mixture made up of (1) an $\alpha\beta$-olefinically unsaturated dicarboxylic acid anhydride, e.g. maleic anhydride, (2) a monomer capable of forming a copolymer, preferably a linear copolymer with the anhydride, e.g. vinyl methyl ether, and (3) a little of a cross-linking agent containing several $CH_2{:}C\langle$ groups, e.g. divinyl benzene, emulsify, disperse and suspend both liquids and solids in aqueous media. C.O.C.

Improving the Properties of Aqueous Emulsions

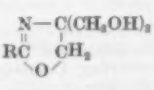
BASF *BP* 801,411

If ethylenically unsaturated carboxylic acid amides, e.g. methacrylamide, are added to aqueous dispersions or emulsions of substances immiscible with water and then polymerised, smooth, readily mobile, creamy and readily spreadable products of improved stability, resistance to frost, compatibility with and binding power for pigments are obtained. C.O.C.

Improving the Lathering Power of Soapless Detergents

Unilever *BP* 800,291

The lathering properties and the stability of the lather of many detergents are improved by addition of a compound of formula—



(R = Alk of 9–13 C), e.g. the 2-nonyl-, 2-hendecyl- and 2-tridecyl-4:4-bis-(hydroxymethyl)-oxazolines derived from capric, lauric and myristic acids. C.O.C.

Textile Size

Wyandotte Chemicals Corpn. *USP* 2,811,462

Stiffer effects are obtained by use of a mixture of 1·5–15·0% by weight of a water-soluble salt of carboxymethylcellulose and 98·5–85·0% of chemically unmodified corn or rice starch, than can be obtained by use of either ingredient alone. C.O.C.

Thickening Agents

Dow Chemical Co. *USP* 2,809,959

Polymers containing $\not<$ 60% by weight of a monovinylaromatic hydrocarbon of the benzene series, e.g. styrene and *ar*-vinyltoluene, are treated with chlorosulphonic acid in presence of liquid SO_2 as reaction medium at −40 to +10°C. The products are not truly soluble in water but can be highly swollen by it. They are used as thickening agents which give compositions exceptionally stable to change in viscosity on ageing. C.O.C.

Antistatic Agent
American Cyanamid Co. *BP* 801,721
Compounds of formula—

$$R^1\text{-}CO\text{-}NH\text{-}(CH_2)_3\text{-}NR^2R^3R^4Y$$

(R^1 = aliphatic or alicyclic; $R^2 = -(C_pH_{2p}O)_mH$ ($p = 2$–4; $m = > 5$), R^3 = Alk or hydroxyalkyl; R^4 = H, Alk or hydroxyalkyl; Y = anion), e.g. γ-stearamido propyl dimethyl monoethoxy ammonium chloride are good antistatic agents. They are applied from solution in a volatile liquid and are especially suitable for use on acrylic fibres. C.O.C.

Antistatic Agent
Dow Chemical Co. *USP* 2,815,301
Sulphonated pentahalogenobenzenes, e.g. the quaternary salt obtained from pentachlorobenzenesulphonic acid and dodecyltrimethylammonium chloride, are excellent antistatic agents especially suitable for use on acrylic fibres. The antistatic finish imparted is fast to repeated washing and dry cleaning. C.O.C.

Polyvinylpyrrolidone as Levelling and Stripping Agent
Ciba *BP* 800,401
Polyvinylpyrrolidone is a good levelling or stripping agent for complex metal compounds of azo dyes being applied to or on nitrogenous basic fibres, e.g. wool. C.O.C.

Neutralising Agents for use in Permanent Waving
Evans Chemetics *BP* 801,990
A mixture of a bromate with urea or sodium lactate acts rapidly and causes no bleaching or degradation of the hair. C.O.C.

Water-soluble Sulphonated Polymeric *ar*-Vinyltoluenes
Dow Chemical Co. *USP* 2,809,960
Polymers containing $< 60\%$ of an *ar*-vinyltoluene are powdered and mixed with a liquid solution containing a chlorosulphonic acid and liquid SO_2 at -20 to $+40$°c. The water-soluble products are used as dispersing and emulsifying agents. C.O.C.

Stable Solid Water-soluble Aminoplast Condensates
Svenska Oljeslageri *BP* 801,404
An amino derivative of carbonic acid is condensed with formaldehyde and while the condensate is still water-soluble it is heated for > 60 sec. to above the m.p. of the anhydrous product, withdrawn from the heating zone while molten and solidified by cooling. The product is very stable even when stored in tropical climates. C.O.C.

Aqueous Emulsions for Rendering Textiles Flame Resistant
U.S. Secretary of Agriculture *USP* 2,810,701
An aqueous emulsion is formed by agitating a mixture of (*a*) water-soluble components of either an aminoplast or nitrilo-methylol-phosphorus resin, (*b*) an inert water-immiscible organic solvent, (*c*) an emulsifying agent, and (*d*) enough water to result in formation of a stable oil-in-water emulsion. C.O.C.

Nitrilo-Methylol-Phosphorus Polymers and Bromine Compounds for rendering Textiles Flame Resistant
U.S. Secretary of Agriculture *USP* 2,814,573
The flame reducing efficiency of nitrilo-methylol-phosphorus polymers is much improved by adding to them an organic material containing $< 10\%$ of Br attached to C atoms. C.O.C.

Aqueous Emulsion of Poly(vinyl Acetate) yielding Coatings of Improved Resistance to Fire
American Potash & Chemical Corpn. *USP* 2,809,949
Addition of a borate composition of B_2O_3:Na_2O ratio by weight of 4–5:1 yields an emulsion which forms coatings of greatly improved resistance to fire and which is not susceptible to damage by moisture. C.O.C.

Poly(vinyl Acetate) Emulsions Stabilised with Hydroxyethyl Cellulose
Shawinigan Chemicals *USP* 2,809,945
Stable poly(vinyl acetate) emulsions which form coatings which on drying have highly improved resistance to water are obtained by using hydroxyethyl cellulose as the stabiliser and adding 0·3–3·0% glyoxal, on the weight of the poly(vinyl acetate), while the emulsion is at > 40°c. C.O.C.

Mothproofing Composition
T. L. Cunningham *USP* 2,811,477
A solution or emulsion in a hydrocarbon solvent of a water-insoluble soap, a solid fatty acid glyceride, an insecticidal chlorinated diphenylethane and a dispersing and stabilising agent is used. This enables the material to be mothproofed to be sprayed, brushed or immersed in the solution or emulsion without any fear of the chlorinated diphenylethane crystallising out on it. C.O.C.

Insect and Rodent Repellent
Virginia–Carolina Chemical Corpn. *USP* 2,811,478
Materials, e.g. paper or textiles, treated with ethyl 2-furoate tetrachloride are repellent to insects and rodents. C.O.C.

Anti-laddering Composition
S. O. B. Ljungbo *BP* 798,546
Monofilament synthetic knitted fabrics are treated with a mixture of a solvent for the particular fibre used in the fabrics along with a miscible non-solvent or diluent and a water insoluble polymer soluble in the mixture of the two solvents. Drying produces an adhesive bond at the intersections in the knitted structure. G.E.K.

Polyamides dissolved in Aqueous 2-Chloroethanol—Coating Compositions
Algemene Kunstzijdeunie *BP* 801,475
A coating composition consists of a single polyamide dissolved in an azeotropic mixture of 2-chloroethanol and water by heating to < 80°c. C.O.C.

Solvent for Synthetic Linear Condensation Polymers
Chemstrand Corpn. *USP* 2,811,497
Molten dimethylsulphone (m.p. 115°c.) is a solvent for polyamides, polyesters and polyurethanes. Thus nylon (1 part) mixed with solid dimethylsulphone (2) and heated to 200°c. yields a clear, almost colourless, very viscous solution suitable for extrusion to form fibres. C.O.C.

Tetramethyldiamino-2-propanol for Stabilising Alkenyl Aromatic Resins to Weathering
Dow Chemical Co. *USP* 2,809,955
Tetramethyldiamino-2-propanol, $(CH_3)_2N\text{-}CH_2CH(OH)\text{-}CH_2\text{-}N(CH_3)_2$, is an effective agent for retarding or preventing impairment by weathering of alkenyl aromatic resin. C.O.C.

Action of Ultraviolet-screening Agents in Organic Coatings (V p. 797)
Cellulosic Solutions containing Flame-retardant Agents (VI p. 799)
Automatic Unit for the Continuous Manufacture of Sodium Hypochlorite (VII p. 801)
Washing and Bleaching Composition for Textiles (VII p. 801)

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Decomposition of Phenyldiazonium Borofluoride in Acetophenone in the Presence of Esters of Benzenesulphonic Acid
L. J. Makarova and M. K. Matveeva
Izvestiya Akad. Nauk S.S.S.R., otdel. khim. nauk, 565–569 (May 1958)
The decomp. of benzenediazonium borofluoride in the presence of the methyl or ethyl ester of benzenesulphonic acid results only in transesterification—

$$C_6H_5{:}N_2{:}BF_4 \rightarrow C_6H_5^+ + N_2 + BF_4^-$$

$$C_6H_5^+ + C_6H_5S(=O)(=O)\text{-}O\text{-}Alk \longrightarrow C_6H_5S(=O)(=O)\text{-}O^+C_6H_5 \longrightarrow$$

$$C_6H_5S(=O)(=O)\text{-}OC_6H_5 + Alk^+$$

(Alk = CH_3 or C_2H_5). On the other hand, the borofluoride in the presence of acetophenone forms a mixture of *m*- and *p*-phenylacetophenone in the ratio of 4:1. These results prove the heterolytic character of the decomp. of phenyldiazonium borofluoride. G.J.K.

Interchange of Sulpho with Hydroxyl Groups in the Aromatic Series
N. N. Vorozhtsov and S. M. Shein

I—Kinetics of the Exchange of the Sodium Sulphonate Group of Naphthalene-β-sulphonic Acid with the Hydroxyl Group
Ukrainian Chem. J., **24**, 208–212 (April 1958)

The action of sodium hydroxide solution at 300–330°c. on the sodium salt of naphthalene-β-sulphonic acid is investigated kinetically. The authors show that this is a second order reaction and that the rate const. and temp. are related by the following equation—

$$\log k = 11{\cdot}73 - \frac{8300}{T}$$

II—Kinetics of the Exchange of the Sodium Sulphonate Group of either 2:6-, or 2:7-Naphthalene-disulphonic Acid with the Hydroxyl Group
Ibid., 213–216

The action of sodium hydroxide solution on the sodium salt of 2:6-naphthalene-disulphonic acid (I) at 240–270°c. and on the sodium salt of 2:7-naphthalene-disulphonic acid (II) at 210–240°c. under pressure is investigated kinetically. Both these reactions are found to be second order and the rate const./temp. relationship is given for I as—

$$\log k = 15{\cdot}24 - \frac{9500}{T}$$

and for II as—

$$\log k = 12{\cdot}19 - \frac{7800}{T}$$

G.J.K.

Peter Griess (1829–1888) and the Burton Breweries
E. R. Ward
J. Roy. Inst. Chem., **82**, 383–389 (June) and 458–463 (July 1958)

The Diazo Centenary
M. Schofield
Dyer, **119**, 751–753 (23 May 1958)

Reactions with ^{15}N. XXVIII—Course of the Diazotisation of Benzhydrazide and 2:4-Dinitrophenylhydrazine
K. Clusius and K. Schwarzenbach
Helv. chim. Acta, **41**, 1413–1416 (Aug. 1958)

The diazotisation of benzhydrazide and 2:4-dinitrophenylhydrazine with $H^{15}NO_2$ produces exclusively azides of the type $R{\cdot}N{:}N{:}^{15}N$, whereas phenylhydrazine affords up to 7% of the isotopic-isomeric $R{\cdot}N{:}^{15}N{:}N$. This result indicates that nearby electrophilic groups direct the attack of the nitrous acid to the outer nitrogen atom, whence the intermediate β-nitroso deriv. formed spontaneously decomp. in water into the terminal labelled azide. This behaviour is in accord with the fact that the nitroso deriv. of benzhydrazide and 2:4-dinitrophenylhydrazine are unknown in a pure condition. H.H.H.

Disproportionation of Hydrazo Compounds on Heating with Salts of Amines and Weak Acids
V. O. Lukashevich and L. G. Krolik
Doklady Akad. Nauk S.S.S.R., **120**, 316–319 (11 May 1958)

The effect of substituents and also of acid strength upon the disproportionation of hydrazobenzene derivatives in the presence of amine salts is investigated at approx. 110°c. and between 10 and 20°c. respectively. At the higher temp., in the presence of 0·1 *M* acid (*M* = concn. of hydrazobenzene derivative) conversion of hydrazobenzene to approximately equimolecular proportions of monoamine and azobenzene occurs most readily with HCl, followed in decreasing order by benzoic, glacial acetic, butyric, and sulphuric acids. The authors explain the disproportionation in terms of the following equations—

$$R{\cdot}NH{\cdot}NH{\cdot}R + HCl \rightleftharpoons R{\cdot}NH{\cdot}\overset{+}{N}H_2{\cdot}R)\bar{Cl} \quad (i)$$

$$2R{\cdot}NH{\cdot}\overset{+}{N}H_2{\cdot}R)\bar{Cl} \rightarrow R{\cdot}N{:}N{\cdot}R + 2R{\cdot}\overset{+}{N}H_3)\bar{Cl} \quad (ii)$$

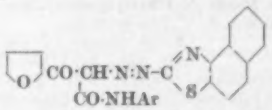
At the lower temp., and in the presence of weak acid, reaction (i) is followed immediately by (ii). *pp'*-Disubstituted derivatives of hydrazobenzene are shown to react more rapidly than the corresponding *ortho*-substituted compounds. G.J.K.

Reaction of Diazonium Compounds. V—Reaction of Aromatic Ethers and Diazonium Compounds
J. Haginiwa, I. Murakoshi, K. Yokota, H. Takayama, and T. Tsuchiya
Yakugaku Zasshi, **78**, 232–236 (1958): *Chem. Abs.*, **52**, 11765 (25 July 1958)

Various alkyl aryl ethers were coupled with diazotised 2:4-dinitroaniline (I), and with diazotised *p*- and *o*-nitroaniline (II) to give azo compounds. Thus anisole coupled with I in the *p*-position to give a 98% yield, and 1:3-dimethoxybenzene coupled at pH 3 in the 4-position with II to give 100% yield of the monoazo compounds. E.S.

Monoazo Substances from Furoylacetanilides and β-Naphthothiazole
E. Farina and N. Marziano
Boll. sedute accad. Gioenia sci. nat. Catania [4], **3**, 460–465 (1957): *Chem. Abs.*, **52**, 10057 (25 June 1958)

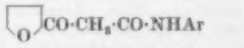
Red dyes—



(Ar = phenyl, *o*- and *p*-toluyl, chlorophenyl, α- and β-naphthyl, etc.) were prepared by coupling diazotised 2-amino-β-naphthothiazole with arylides of 2-furoylacetic acid and m.p's and λ_{max} recorded. E.S.

New Monoazo Compounds from Furoyl Acetarylides—II
A. Cerniani
Ricerca Sci., **26**, 2404–2408 (1956): *Chem. Abs.*, **52**, 10048 (25 June 1958)

Diazotised 2-aminothiazole (I) and 2-aminobenzothiazole (II) were coupled with arylides of 2-furoylacetic acid—



(Ar = phenyl, *o*- and *p*-toluyl, chlorophenyl, α- and β-naphthyl, thiazolyl, benzothiazolyl, etc.) to give monoazo compounds, whose m.p. and crystalline form are listed. The changes in Ar have little effect on λ_{max} and log ε. On nylon and cellulose acetate the dyes derived from II are faster to washing than those from I. E.S.

Some Disperse Dyes from Pyrocatechol Dialkyl Ethers
N. Kuroki, A. Nishiura, and K. Konishi
Kôgyô Kagaku Zasshi, **59**, 1053–1056 (1956): *Chem. Abs.*, **52**, 10582 (25 June 1958)

Yellow monoazo dyes obtained by diazotising 4-aminopyrocatechol dialkyl ethers (I) and coupling with *p*-cresol, and nitrodiarylamines obtained by condensing I with 2:4-dinitrochlorobenzene, were examined by dyeing on cellulose acetate, vinylon, and Amilan (6-nylon). Dyeing properties decrease with increase in the length of the alkyl chains. E.S.

Preparation of Triphenylmethane Dyes from Phenol and Dihydroxydiphenylmethane
Y. Nakamura
Kôgyô Kagaku Zasshi, **59**, 1220–1224 (1956): *Chem. Abs.*, **52**, 13266 (10 Aug. 1958)

Phenol and 2:4′- and 4:4′-dihydroxydiphenylmethane were reacted together in 0:1 to 3:1 mole ratio in presence of NaOH at 115–130°c. for various times up to 7 hr. to determine colorimetrically the density of the colour produced. Presence of MnO_2 markedly accelerates production of colour. The dyes, obtained by extracting the resinous products with alcohol and precipitating with water, were spectroscopically examined at 200–600 mμ. The spectra of novolac, resol and C-type resin obtained under the same conditions were compared with those of the dyes and the mechanism of colouring discussed. It is suggested that the OH group in 4- (or 4′-) position is changed to a quinone radical and that the methylene groups react with phenol mostly at *p*-position to the OH. 4:4′-dihydroxydiphenylmethane tends to self-condensation in presence of alkali and MnO_2 by a monomolecular reaction with activation energy of 25·2 kcal./mole. Correlation of colouring with Br absorption is also discussed. C.O.C.

Hydrazides from Polyacrylic Acids. III— Macromolecular Azo Dyes

W. Kern, K. Fendel, R. Holländer, and R. Schneider

Kunststoffe-Plastics, **3**, 147–150 (1950): *Chem. Abs.*, **52**, 11766 (25 July 1958)

Azo derivatives of polyacrylic acids were prepared in 4 different ways. (i) Polyacrylic hydrazones were coupled with low mol.wt. diazonium salts, e.g. polyacrylic hydrazone of salicylaldehyde (I) with diazotised aniline gave a light brown dye. (ii) Polymeric diazonium salts were coupled with low mol.wt. coupling components, e.g. polyacrylic hydrazone of *p*-aminobenzaldehyde (II) was diazotised and coupled with β-naphthol to give a dark red dye. (iii) Polymeric diazonium salts were coupled with polymeric compounds, e.g. II → I was a red–brown insoluble dye. (iv) Polyacryloylhydrazide was combined with aldehydes containing azo groups, e.g. *p*-aminobenzaldehyde→Naphtol AS-ITR. E.S.

Disazo Dyes from *N*-Phenylquinaldine

G. T. Pilyugin and S. V. Shinkorenko

Khim. Nauka i Prom., **2**, 796–797: *Chem. Abs.*, **52**, 11850 (25 July 1958)

N-Phenylquinaldine coupled with diazotised aniline and diazotised *p*-nitroaniline to give disazo dyes. E.S.

Synthetic Dyes

IX— Synthesis of Bisazo Dyes by Condensation of Diazo Compounds with Salts of *N*-Arylquinaldines

G. T. Pilyugin and S. V. Shinkorenko

J. Gen. Chem. U.S.S.R., **28**, 1313–1316 (May 1958)

The possibility that the α-methyl group of *N*-arylquinaldine salts might react with diazonium compounds to form a new type of bisazo dye (2 azo linkages attached to the same carbon atom) is investigated. Two dyes of this type have been isolated and characterised from their absorption spectra; thus bisphenylazo-*N*-phenyl-2-quinolinemethane perchlorate absorbs at 458 mμ., whereas the *p*-nitrophenyl derivative absorbs at 588 mμ.

X— Synthesis of *N*-Aryl-2-β-anilinovinylquinolinyl Derivatives and their Transformation

G. T. Pilyugin, E. P. Opanasenko, and S. V. Shinkorenko

Ibid., 1316–1320

The first synthesis of *N*-phenyl-2-β-anilinovinylquinolinyl perchlorate and *N*-phenyl-2-β-anilinovinyl-5:6-benzoquinolinyl iodide is given. The condensation of these substances with quaternary salts of heterocyclic bases allows the preparation of 5 new carbocyanine dyes, the absorption maxima of which are given.

XI— Condensation of the Salts of *N*-Arylquinaldine with Nitroso Compounds

G. T. Pilyugin and S. V. Shinkorenko

Ibid., 1320–1324

The preparation of 4 new azomethin dyes by the condensation of *N*-arylquinaldine iodide or perchlorate (I), which contains an active methyl group in the α-position, with an aromatic nitroso compound is described. Thus a 4-dialkylaminophenyl-1-(1′-phenylquinolinyl-2′-azomethin) iodide, or perchlorate, is produced. Similarly, the reaction of I with α-nitroso-β-naphthol produces analogous azomethin dyes. G.J.K.

Tautomerism in Aprotic Solvents. I— Protolysis of Carboxylic Acids by Hexamethyltriaminotriphenylcarbinol

M. I. Kabachnik and S. T. Ioffe

Izvestiya Akad. Nauk S.S.S.R., otdel khim. nauk, 628–630 (May 1958)

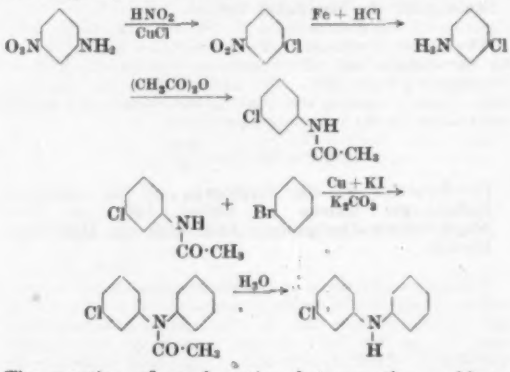
A colorimetric method for the determination of the protolysis const. of formic, benzoic, acetic and propionic acids in aprotic solvents of low dielectric const. (benzene or chlorobenzene) in the absence of buffers is described. In such solvents the neutralisation reaction of a base, e.g. Crystal Violet in the carbinol form, with these acids results in the formation of ionic pairs which the authors claim do not dissociate. The protolysis const. obtained by the above method, when determined in accordance with Brønsted's rule, can be utilised for the determination of the tautomeric equilibrium const. in non-aqueous solvents. G.J.K.

Synthesis of 3-Chlorodiphenylamine

S. V. Zhuravlev and A. N. Gritsenko

J. Appl. Chem. U.S.S.R., **31**, 661–662 (April 1958)

The following route leading to the preparation of 3-chlorodiphenylamine is described—



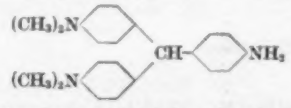
The reaction of condensation between the *m*-chloroacetanilide and the bromobenzene takes place only in the presence of nitrobenzene used as an indifferent solvent. T.Z.W.

Triphenylmethane Dyes. II— Introduction of the Triazole Group into the Triphenylmethane Skeleton

J. Pardubice-Rybitvi and J. Dvořák

Chem. Listy, **52**, 109–115 (1958): *Chem. Abs.*, **52**, 12401 (25 July 1958)

Amino-containing triphenylmethane derivatives, e.g.



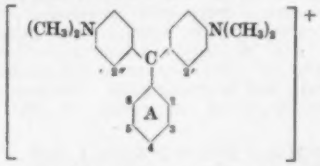
are diazotised and coupled with 2-naphthylamine. Oxidation of the product with Cu acetate in pyridine gives the triazole. The corresponding carbinol is formed by further oxidation with PbO_2 in acid medium. Similar products may be made from diphenylmethane and benzophenone derivatives. Practical details are given and m.p.'s of recrystallised and chromatographically purified products. E.T.

Difluoro-substituted Malachite Green

K. Inukai and Y. Maki

Kôgyô Kagaku Zasshi, **59**, 1160–1163 (1956): *Chem. Abs.*, **52**, 13265 (10 Aug. 1958)

Decomposition of the diazonium borofluoride of 2-amino-3-nitro-, 2-amino-4-nitro-, 2-amino-5 nitro- and 2-amino-6-nitrotoluene in *m*-xylene yielded the corresponding monofluoro derivatives. These were reduced to amino derivatives and then converted to the corresponding difluorotoluenes by decomposing their diazonium borofluoride. Finally they were treated with gaseous Cl and H_2SO_4 to give the 2:3-, 2:4-, 2:5- and 2:6-difluorobenzaldehydes. The reaction of 1 mol. of the difluorobenzaldehyde with 2·5 mol. of dimethylaniline and $ZnCl_2$ by heating them in a water bath gave the corresponding leuco compounds of Malachite Green substituted by F at 2:3-, 2:4-, 2:5-, and 2:6-positions in ring A—



Similarly the reaction between 2 mol. of 3-fluorodimethylaniline and 0·4 mol. of benzaldehyde in presence of $ZnCl_2$ gave the 2′:2″-difluoro derivative of leuco Malachite Green. Derivatives having F in the A ring gave blue to bluish green dyeings of good fastness to light but the 2′:2″-difluoro derivative was yellowish and of poor fastness to light. The absorption spectra are given. C.O.C.

Preparation and Properties of some Aryl Derivatives of Thioxanthenol 5-Dioxide possessing Indicator Properties
V. S. Étlis and G. A. Razuvaev
J. Gen. Chem. U.S.S.R., **28**, 1225–1227 (May 1958)

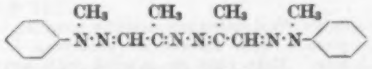
The synthesis of sulpho derivatives of thioxanthenol 5-dioxide by sulphonation of 4-benzyldiphenyl, α-benzylnaphthalene, and αα′-dinaphthylmethane with oleum at elevated temp. is described, and reference is made to acidimetric indicator properties of these sulphonic acids. A simple method for the preparation of αα′-dinaphthylmethane from naphthalene and αα′-dichlorodimethyl ether in nitrobenzene in the presence of $AlCl_3$ is given. G.J.K.

Monoanils of Glutaconic Dialdehyde. II— Effect of Solvent on the Colour of Derivatives of Primary Aromatic Amines
N. E. Grigor'eva and I. K. Gintse
J. Gen. Chem. U.S.S.R., **28**, 1682–1689 (June 1958)

The absorption spectra of 8 monoanils of glutaconic aldehyde in different solvents and in the presence of acid or alkali is investigated. The change in the position of the absorption band is explained in terms of solvent-solute interaction for solvents such as— simple alcohols, acetone, dioxan, benzene and its derivatives. The authors put forward certain theories and claim that it is not possible to distinguish, in principle, between halochromism and solvatochromism. G.J.K.

Ketazine Bishydrazones and their Coloured Salts
G. Henseke and H. J. Binte
Ann., **612**, 205–228 (1958):
Chem. Abs., **52**, 11767 (25 July 1958)

α-Dicarbonyl compounds, e.g. CH_3·CO·CHO, were converted into arylhydrazones, and methods given for preparing their yellow and orange bishydrazone azines such as



which give red salts with, e.g. HCl. E.S.

Cyanine Dyes. XIII— 6:6′-Disubstituted Thiacyanines containing Unsaturated Substituents
I. K. Ushenko and S. E. Gornostaeva
J. Gen. Chem. U.S.S.R., **28**, 1668–1677 (June 1958)

Diazotisation of 2-methyl-6-aminobenzothiazole and reaction with acrylic acids produces 2-methyl-6-styryl- and 2-methyl-6-(α-thienylvinyl)benzothiazole. The ethyl ester of *p*-toluenesulphonic acid forms the quaternary salts of the above bases which, on reaction with ortho-esters and intermediate products, lead to the formation of 7 symmetrical, 5 asymmetrical thiocarbocyanines and 3 rhodacyanines. The presence of unsaturated groups in the 6-position of the benzothiazole system causes a strong bathochromic displacement of the absorption spectra of the cyanine dye. G.J.K.

Nitro and Amino Compounds of Phenylated Derivatives of Thiophen— I
V. N. Ivanova
J. Gen. Chem. U.S.S.R., **28**, 1232–1238 (May 1958)

The nitration of α- and β-phenylthiophen results in the formation of α′- and β′-nitro-α-phenylthiophens (I and II), α′-nitro-β-phenylthiophen (III) and β-*p*-nitrophenylthiophen respectively. The synthesis of the corresponding α′-amino-α-, and β-phenylthiophene, using $SnCl_2$, is given. It is shown that the amino group in these compounds is capable of diazotisation and subsequent coupling.

II— Absorption Curves of α- and β-Phenylthiophens and of their Nitro Compounds
Ibid., 1238–1240

The absorption spectra of α- and β-phenylthiophens are recorded, and the analogy between the spectra of these compounds and that of diphenyl is stressed. Spectra of I, II, and III are also given. G.J.K.

Chemistry of Benzilin (C.I. 75280) and Haematoxylin (C.I. 75290)
R. Robinson
Bull. Soc. chim. France, 125–134 (1958):
Chem. Abs., **52**, 12852 (10 Aug. 1958)

A historical review, 74 references. C.O.C.

Pyrrole Dyes. VII— Blue Pyrrole Dyes
A. Treibs, E. Herrmann, and E. Meissner
Ann., **612**, 229–241 (1958):
Chem. Abs., **52**, 12839 (10 Aug. 1958)

Condensation of substituted pyrroles with ninhydrin, alloxan, 1:3-indandione or *peri*-naphthenone gave blue to green dyes. Thus, warming ninhydrin (320 mg.) with 2:4-dimethyl-3-ethoxycarbonylpyrrole in acetic acid (3 ml.) for 30 sec. and adding water yielded 70% of the yellow 2-(3-ethoxycarbonyl-2:4-dimethyl-5-pyrryl)-2-hydroxy-1:3-indandione. This on reduction with Zn gave the leuco base 2-(3-ethoxycarbonyl-2:4-dimethyl-5-pyrryl)-1:3-indandione. Warming 100 mg. of this leuco base for 30 sec. in acetic acid (3 ml.) with conc. HCl (3 drops) yielded a blue dye. Numerous other examples are given. C.O.C.

2:4-Di-(ethyleneimino)-1:3:5-triazines
L. E. Sventsitskaya, A. A. Kropacheva, and S. I. Sergievskaya
J. Gen. Chem. U.S.S.R., **28**, 1601–1607 (June 1958)

6-Substituted 2:4-di-(ethyleneimino)-1:3:5-triazines are prepared. The substituents are *N*-containing heterocycles and esters of fatty and alkaryl amino acids, e.g. the benzoate of *N*-(2:4-diethyleneimino-1:3:5-triazine-6)-*dl*-α-aminopropionic acid is prepared and characterised. G.J.K.

Affinity of Immedial Indone RR (C.I. Sulphur Blue 7) for Cotton
Y. Hiyama, M. Nakagaki, and H. Hiyama
Kōgyō Kagaku Zasshi, **59**, 1163–1168 (1956):
Chem. Abs., **52**, 13266 (10 Aug. 1958)

Adsorption of Asashio Blue F5R (presumably the equivalent of the dye named in the title— *Abstractor*) on cotton at 80–100°c. was examined in presence of various amounts of Na_2S. Adsorption of NaHS and NaOH by the cotton was also determined. Theoretical treatment of the resulting data showed that 1 mol. of the dye is adsorbed on cotton together with 3 atoms of Na. The affinity of the dye for cotton at 100, 90, and 80°c. was calculated as −3·40, −3·66 and −3·90 kcal./mole, respectively. Heat of dyeing was −13 kcal./mole. C.O.C.

Synthesis of Carotene Homologues
J. D. Surmatis, J. Maricq, and A. Offner
J. Org. Chem., **23**, 157–162 (1958):
Chem. Abs., **52**, 12809 (10 Aug. 1958)

Total syntheses are described of a C_{41} hydrocarbon, 1-(2:6-dimethyl-6-ethyl-1-1-*cyclo*hexen-1-yl)-18-(2:6:6-trimethyl-1-*cyclo*hexen-1-yl)-3:7:12:16-tetramethyl-1:3:5:7:9:11:13:15:17-octadecanonaene, a C_{42} hydrocarbon, 1:18-bis(2:6-dimethyl-6-ethyl-1-*cyclo*hexen-1-yl)-3:7:12:16-tetramethyl-1:3:5:7:9:11:13:15:17 octadecanonaene and a C_{44} compound, 1:18-bis(2:6-dimethyl-6-*iso*butyl-1-*cyclo*hexan-1-yl)-3:7:12:16-tetramethyl-1:3:5:7:9:11:13:15:17-octadecanonaene. The latter resembles *trans*-β-carotene in colour and other physical properties. C.O.C.

Intermediate Stages in the Photochemical Oxidation of Chlorophyll by Oxygen
I. I. Dilung
Ukrainian Chem. J., **24**, 202–207 (April 1958)

The irradiation of chlorophyll by light of wavelength corresponding to the red absorption band of chlorophyll produces an irreversible reaction; further stages of photochemical oxidation can only occur by the attack of photons on this red intermediate product. The effect of hydrogen ions and various solvents on the final product produced by dehydrogenation is discussed. G.J.K.

Absorption and Scattering of Light in Pigments
A. S. Toporets
Optika i Spektroskopiya, **4**, 494–500 (1958):
Chem. Abs., **52**, 12557 (10 Aug. 1958)

The absorption and scattering of Cadmium Red (C.I. Pigment Red 108) and Cobalt Blue (C.I. Pigment Blue 28) were determined from their reflective spectra and found to be in good agreement with the microspectrophotometric measurements of the individual particles. The proportionality between the difference in functions and the concentration of the absorbing pigment when mixed with TiO_2, MgO, ZnO, $CaSO_4$ or powdered glass was established by the method of dilution. The numerical values of the reflection coefficients depend on the absorption and scattering properties of the reflecting layer. C.O.C.

Quinone Series. XII— Synthesis of Cellulose Acetate Dyes from 2:2-Dichloro-1:4-naphthoquinone and Chloranil
M. S. Mathur and B. D. Tilak
J. Sci. Ind. Research (India), **17B**, 33–40 (1958): *Chem. Abs.*, **52**, 12862 (10 Aug. 1958)

Synthesis of a series of quinoid cellulose acetate dyes derived from 2:5-dichloro-1:4-naphthoquinone and chloranil, is described. The ethyl ester of 1-carboxy-2:3-phthaloylpyrrocoline was the most promising. The amides and higher esters of 1-carboxy-2:3-phthaloylpyrrocoline showed improved tinctorial and fastness properties. Aza, diaza, and triaza phthaloylpyrrocolines are weakly substantive to cellulose acetate. Some of the 2-alkyl(or aryl)amino-3-chloro-1:4-naphthoquinones dye cellulose acetate in attractive colours. Dipyrrocolinequinones derived from chloranil are only weakly substantive to cellulose acetate. C.O.C.

Colour Phenomena in *N*-Phenylglycyl Derivatives of α-Aminoanthraquinone
E. A. Smirnov
Doklady Akad. Nauk S.S.S.R., **120**, 805–808 (1 June 1958)

The colour of *N*-phenylglycyl-α-aminoanthraquinones has been compared in general terms with those of α-phenylaminophenylanthraquinone. Not only is the colour in solution (solvent either dichloroethane or pyridine) at different concn. determined but also the colour of the crystal and of the powder form of the above vat dyes is given. The author explains the depth of colour in the solid state, and in conc. soln. (as distinct from that in very dil. soln.) in terms of the interaction of the non-conjugated electron-donating $C_6H_5{\cdot}NH$-system with the anthraquinone nucleus by means of exomolecular interactions. G.J.K.

Nature of Betanin, the Pigment of Red Beet
R. G. Peterson and M. A. Joslyn; R. Robinson
Nature, **182**, 45–46 (5 July 1958)

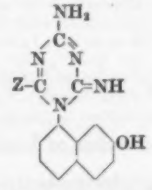
Ultraviolet and infrared spectra of the recently obtained purified red pigment show absence of aromaticity. Nitrogen content and other evidence suggest betanin should be considered as a pyrrole pigment and not a "nitrogenous anthocyanin" as proposed by R. Robinson and others. Other beet pigments are thought to be similar to, and precursors of, the red one.

Commenting on the above letter Robinson points out that evidence for the pyrrole structure is not much stronger than that for his own speculative amino-flavylium salt proposal. He considers further work, especially degradative, to be necessary to solve the problem. R.B.B.

PATENTS

Metal(Chromium and Cobalt)-complex Monoazo Wool Dyes having a Triazine Ring
FBy *BP* 798,171

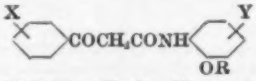
Diazotised benzene series amines free from SO_3H and COOH groups and having a chelatable group *ortho* to the diazo group are coupled with 7-hydroxynaphthyl-1-triazine compounds—



(Z = H, OH, or Alk) to give monoazo compounds, whose CO and Cr complexes dye wool, nylon, etc. brown, olive or grey from neutral or weakly acid baths. The coupling components are made by treating 7-hydroxy-1-naphthylbiguanidine with acylating agents such as formic acid, acetic anhydride, phosgene, etc., or with urea or formamide as described in *GP* 864,951. Thus diazotised 2-aminophenol-4-sulphonamide is coupled under alkaline conditions with 2-amino-4-imino-7-hydroxy-1′:5-naphthyl-triazine(1:3:5) (Z = H). The Cr complex of the resultant monoazo dye is a bluish grey, and its Co complex is a reddish grey. E.S.

Colour Couplers
Kodak *BP* 800,108

Colour couplers for producing yellow dye images are of formula—



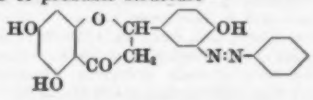
(R = Alk of 1–20 C; X = H when Y = a photographically inactive carboxylic acid acylamido group and vice versa), e.g. α-benzoyl-2-methoxy-4-nitroacetanilide. C.O.C.

Red Carotenoid Food Dye
F. Hoffmann-La Roche & Co. *BP* 801,736

1:26-di[2′:6′:6′-trimethyl*cyclo*hexen-(1′)-yl]-3:7:11:16:20:24-hexamethyl-hexacosadodecaen-(1:3:5:7:9:11:15:17:19:21:23:25)-yne-(13) is readily soluble in animal and vegetable oils for use as a food colour. It is made by condensing a 3:8-dimethyl-2:9-di(lower alkoxy)-decatetraen-(1:3:7:9)-yne-(5) at both chain ends with an 8-[2′:6′-6′-trimethyl-*cyclo*hexen-(1′)-yl]-2:6-dimethyl-1:1-(lower alkoxy)-octatriene-(2:4:6), treating the resulting 1:26-di[2′:6′:6′-trimethyl-*cyclo*hexen-(1′)-yl]-3:7:11:16:20:24-hexamethyl-8:10:10:17:17:19-hexa(lower alkoxy)-hexacosaoctaen-(2:4:6:11:15:20:22:24)-yne-(13) with an acidic agent, reducing the resulting 1:26:di[2′:6′:6′-trimethyl-*cyclo*hexen-(1′)-yl]-3:7:11:16:20:24-hexamethyl-hexacosadecaen-(2:4:6:8:11:15:18:20:22:24)-yne-(13)-dione (10:17) to 1:26-di[2′:6′:6′-trimethyl-*cyclo*hexen-(1′)-yl]-10:17-dihydroxy-3:7:11:16:20:24-hexamethyl-hexacosadecaen-(2:4:6:8:11:15:18:20:22:24)-yne-(13) and treating that with a hydrohalic acid (aqueous or nonaqueous) to cause formation of two additional double bonds and effect an allyl rearrangement with formation of the desired product. C.O.C.

Azo Dyes from Citrus Flavanones— Wood Stains
Chadeloid Corpn. *BP* 799,901
USP 2,813,801

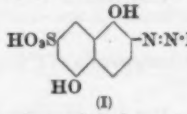
Water-soluble wood stains are made by coupling suitable diazo compounds with flavanones occurring in citrus pulp or waste. They may be applied with an optical brightener, e.g. β-methylumbelliferone. Thus diazotised aniline coupled with naringenin from grapefruit waste gives a dye of probable structure—



E.S.

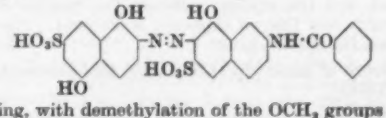
Grey Metal(Copper)-complex Trisazo Direct Dyes
S *BP* 799,925

Grey direct dyes, similar to those of *BP* 695,534 (J.S.D.C., **69**, 385 (1953)) are obtained by coupling tetrazotised *o*-dianisidine with 1 mol. of a monoazo compound—



(I)

(R = radical of aminonaphtholmono(or di)sulphonic acid which may be *N*-alkylated, -arylated, -acylated, etc., coupled *ortho* to the OH group), or with the Cu-complex of I, and with 1 mol. of the same or other coupling component coupling *ortho* to an OH group, and converting the resultant trisazo compound into a Cu-complex. The light and washing fastness of the dyeing may be improved by aftertreating with a polyalkylenepolyamine in presence of a Cu salt. Thus tetrazotised dianisidine is coupled first with 1 mol. of 1-naphthol-3:8-disulphonic acid, and then with a soln. in aq. ammoniacal pyridine of 1 mol. of the Cu-complex of the monoazo compound—

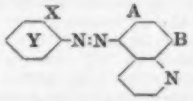


Coppering, with demethylation of the OCH_3 groups of the dianisidine is carried out by heating at 95–97°c. for 20 hr. in aq. ammoniacal $CuSO_4$ in presence of diethanolamine. E.S.

Metallisable Monoazo Disperse Dyes

ICI *BP* 800,144

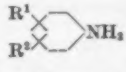
Monoazo disperse dyes—



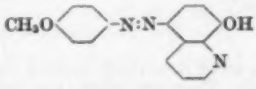
(X = OH, COOH, or $COOCH_3$; the ring Y may contain further substituents; of A and B, one = OH, and the other = OH or NH_2) may be metallised on cellulose acetate, nylon, and polyacrylonitrile fibres, especially with Cu salts, to give reds, violets, and browns of good fastness to light, washing, and sublimation. Thus, 2-amino-4-chlorophenol is diazotised and coupled with a soln. in aq. NaOH, containing Na_2CO_3 and β-ethoxyethanol, of 6:8-dihydroxyquinoline. A dispersion of the monoazo dye so formed applied to cellulose acetate or nylon and after-coppered with $CuCl_2$ or the complex from $CuSO_4$ and ethylenediamine, gives bordeaux.

BP 800,145

Orange dyes of similar properties are obtained by diazotising an amine—



(R^1 = OCH_3 or hydroxyalkoxy; R^2 = H, Hal, Alk, NH_2, NH·CO·CH_3, OAlk, CF_3, SO_2Alk, SO_2·NHAlk, SO_2·$N(Alk)_2$, or sulphondihydroxyalkylamido) and coupling with 8-hydroxyquinoline (I). Thus diazotised *p*-anisidine is coupled with I to give—

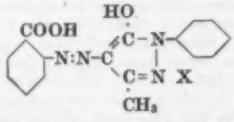


E.S.

Metal(Chromium)-complexes from Mixtures of Two Monoazo Dyes

Ciba *BP* 798,746

Mixtures of a monoazo compound of the type—

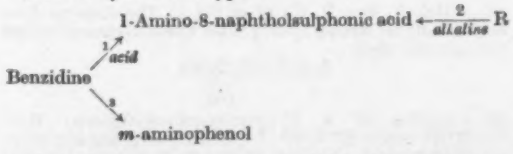


(X = Alk, OAlk, or Hal) with an *oo'*-dihydroxy- or *o*-carboxy-*o'*-hydroxy-monoazo compound free from SO_3H or further COOH groups, are converted into Cr-complexes containing ca. 1 atom Cr to 2 mol. of monoazo compounds, which dye wool, etc., from neutral or weakly acid baths. Thus 1 mol. of each of the monoazo compounds anthranilic acid→1-*o*-ethylphenyl-3-methyl-5-pyrazolone and anthranilic acid→β-naphthol are boiled with aq. sodium chromosalicylate to give the complex which dyes wool yellowish red-brown. E.S.

Black Trisazo Dye for Leather

CFM *BP* 798,545

Trisazo dyes of the type—

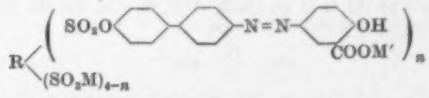


(R = benzene series aminosulphonic acid containing CH_3 and/or OAlk as nuclear substituent) give well-penetrated blacks on leather. Thus tetrazotised benzidine is acid-coupled with 1 mol. of H acid, and a diazo soln. from 4-aminoanisole-2-sulphonic acid is then added, followed by aq. $NaCO_3$. Finally *m*-aminophenol is added, to give the trisazo dye. E.S.

Chromable Azo-Phthalocyanine Dyes

DuP *USP* 2,801,997

Bluish-green to yellowish-green dyeings on cellulosic fibres or wool which, after chroming, are fast to light and washing are obtained by using dyes of formula—

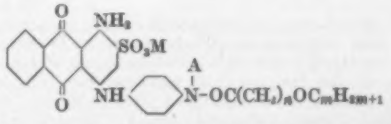


(R = Cu phthalocyanine or its mono-halogen derivative; M, M' = H, alkali metal or NH_4; n = 1–3). The dyes are made by reacting a Cu phthalocyanine tetrasulphonyl chloride (1 mol.) with 4-hydroxybiphenyl-4'-azo-salicylic acid (1–3 mol.). Thus, Cu-phthalocyanine tetrasulphonyl chloride may be prepared by heating Cu phthalocyanine (1) in $ClSO_3H$ (3·6) at 130–135°c. for 8 hr., cooling to 60°c. and pouring into ice (12) and NaCl (1·3) filtering and washing with 10% NaCl (27) at 0°c. The ice-cold filter cake is converted to a chromable dye by slurrying with ice (12) and adding a solution of 4-hydroxybiphenyl-4'-azo-salicylic acid (1·45) in water (27) containing NaOH (0·72) at 10°c. After stirring the mixture at 0°c. for 7 hr. and at 25–30°c. for 8 hr., NaCl (11) is added. Acidification with 12% HCl at 10°c. follows and the dye is then filtered and washed acid-free with 20% brine. The dyes are applied to cotton, viscose or wool from neutral baths containing NaCl or Na_2SO_4 and are after-chromed to obtain maximum fastness. E.T.

Anthraquinone Acid Levelling Blues

S *BP* 799,732

Blue anthraquinone dyes, applicable to wool, silk, and polyamide fibres from weakly acid baths, which level excellently and are very fast to light and washing, are of formula—

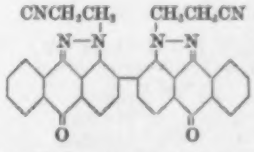


(A = H, CH_3; M = monovalent cation; n = 1–2; m = 2–5). When m = 2–3, the dyes have a solubility of 10 g./l. in 0·6% aq. H_2SO_4 at 35–40°c. They are made by reacting the appropriate anthraquinone derivative with a functional derivative of an alkoxy-fatty acid. Thus, 1-amino-4-(4'-methylamino)-phenylaminoanthraquinone-2-sulphonic acid (8·5) is suspended in pyridine (50); $NaHCO_3$ (6) is added and, over 15 min. at 20–25°c., 2-(isoamyloxy)-propionyl chloride (5) is added dropwise. Completion of reaction is indicated by column chromatography using talc. The pyridine is removed by steam, the dye is salted and separated by filtration. 30 examples of dyes of this series, all giving reddish-blues on wool, are listed. E.T.

Red Dipyrazoloanthrone Vat Dyes

General Aniline *USP* 2,802,829

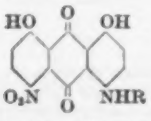
Dark red dyes applied to cotton from an alkaline $Na_2S_2O_4$ bath to give dyeings fast to light, washing and chlorine are of formula—



(nuclear substituted Hal, lower alkyl or NH_2 groups may be present). The above dye is made by heating, at 79°c., dipyrazoloanthrone (5), acrylonitrile (40) and 40% aq. tetraethanol ammonium hydroxide (2 pts. by vol.). Cooling, dilution with acetone (80) and filtration follow. The substituted derivatives are made from substituted dipyrazoloanthrones or, alternatively, the halogen substituted derivatives may be obtained by halogenating the unsubstituted dye in a solvent, e.g. $ClSO_3H$, in the presence of a catalyst, e.g. iodine. E.T.

Metal Complexes of Anthraquinone Derivatives and their Uses
Eastman Kodak *BP* 799,708

Blue dyeings on cellulose acetate with good to excellent fastness to washing, light, and gas-fumes are given by the reaction products of (*a*) a salt of Cr, Co, Cu, Fe, Mn, Ni or Va with (*b*) a deriv. of formula—



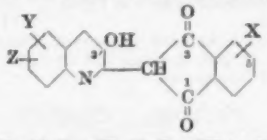
(R = Alk of 1–4 C, hydroxyalk of 2–4 C, alkoxyalkyl of 3–4 C, β-hydroxy-β-ethoxyethyl, β-hydroxy-β-ethoxy-β-ethoxyethyl, subst. or unsubst. aryl nucleus of the benzene series). These anthraquinone compounds are obtainable by the methods of *BP* 716,333; 716,564; 716,937 (J.S.D.C., 71, 58, 59 (1955)) and *USP* 2,053,274; 2,480,269. The dyes of the present patent may also be used on cellulose alkyl carboxylic ester and acrylonitrile polymers. Three methods of application are possible. (1) The anthraquinone derivative is reacted with metal salt; thus, 1:8-dihydroxy-5-nitro-4-anilinoanthraquinone (1·88) is refluxed with acetone (30 c.c.), 28% NH_4OH (4 c.c.) is added followed by nickelous acetate (1·37) in hot 50% aq. acetone. After 2·5 hr. at the boil the mixture is drowned into water (800 c.c.). The product is separated by filtration, hot water washing and drying at 60°C. It is then applied to the fibre by dyeing from a dispersion. (2) The fibre to be dyed is treated with a metal salt and an appropriate anthraquinone derivative is then applied to the treated fibre. (3) The procedure of (2) is reversed. E.T.

Anthraquinone Dyes which Combine with Cellulose (Reactive Dyes)
ICI *BP* 798,121

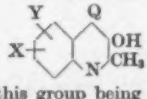
Aminoanthraquinone compounds containing solubilising groups and carrying as *N*-substituent a 1:3:5-triazine radical containing at least one halogen atom attached to a C atom of the triazine ring, combine with cellulose in presence of an acid-binding agent, and hence may be used to produce dyeings and prints (mainly blue) of good wet fastness. Thus an aq. soln. of 1-amino-4-(4′-aminoanilino)-anthraquinone-2:3′-disulphonic acid is stirred at < 4°C. with a suspension of cyanuric chloride in presence of soda ash. The water-soluble product is padded cold on to cotton cloth, which is then dried and immersed in 6% aq. NaOH saturated with NaCl for 2 min. at 95°C. Rinsing, treating in aq. acetic acid and finally scouring in soap and soda completes the development of the fast blue. E.S.

Quinophthalone Disperse Dyes
DuP *USP* 2,818,410

Yellow disperse dyes, of good fastness to light and sublimation and with good building-up properties, for use with hydrophobic fibres, e.g. nylon, Terylene, are



(X = NO_2, NH_2; Y, Z = H, Cl, Br, CH_3). They are made by condensing a 3-hydroxyquinaldine



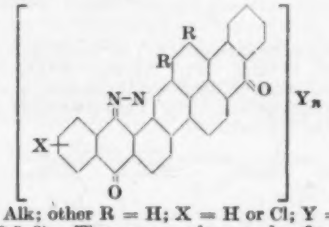
(Q = H or COOH this group being generally eliminated during the reaction) with a nitrophthalic acid at 165–250°C. in an inert solvent. Thus, 3-nitrophthalic acid (211), 2-methyl-3-hydroxyquinoline-4-carboxylic acid (203) and *o*-dichlorobenzene (2600) are heated for 18 hr. at 165–70°C. The cooled melt is stirred with 3% NaOH (7000) and activated C (30). The slurry is filtered and the solvent layer separated. Addition of conc. HCl to give pH 8 precipitates the quinophthalone derivative which is filtered, washed, and dried. E.T.

Acylamino-aminoanthraquinones
FBy *BP* 800,962

Valuable vat dye intermediates are anthraquinone compounds containing amino group(s) and acylamino group(s) in which the acylamino group is derived from a heterocyclic *N*-containing carboxylic acid. The method of preparation is based on the observation that, whilst ordinary acylamino groups (e.g., acetyl, benzoyl) may be deacylated (hydrolysed) to give the parent amino group by heating in conc. H_2SO_4 at moderate temperatures, those from heterocyclic *N*-containing carboxylic acids are stable in conc. H_2SO_4 even at 90–100°C. Thus, the product obtained by acylating 1-amino-5-benzoylaminoanthraquinone with *iso*nicotinic acid (40) is heated with 96% H_2SO_4 (460) 15 min. at 90°C. Dilution at 20–30°C. with water to 50% H_2SO_4 strength precipitates the sulphate of 1-*iso*nicotinoylamino-5-aminoanthraquinone. Filtration, washing with 50% H_2SO_4 and boiling the product with water and ammonia give a 90% yield of the acylamino-aminoanthraquinone. Among the other similar products listed are 1-(5′:6′-phthalylquinoline-8′-carbonyl)-amino-5-amino- and 1-(1′:9′-anthrapyrimidine-2′-carbonyl)-amino-5-amino-anthraquinone. E.T.

Benzanthrone–Pyrazoloanthrone Vat Dyes
FH *BP* 800,971

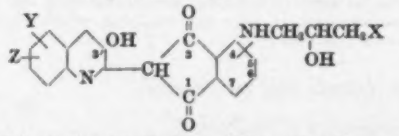
Violet to blue vat dyes of very good fastness to chlorine are of formula—



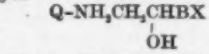
(one R = Alk; other R = H; X = H or Cl; Y = H, Cl or Br; *n* = 0·5–2). They are made, e.g. by first reacting pyrazoleanthrone with Bz-1-chloro-Bz-2-ethylbenzanthrone in presence of K_2CO_3 and dimethylformamide at raised temperature to give *N*(1)-(Bz-1′-(Bz-2′-ethyl)-benzanthronyl)-pyrazoleanthrone. This intermediate (20) (m.p. 363°C.) is added at 90°C. to a melt of KOH (25) and ethanolamine (30) and stirred for 1 hr. at 90°C. Pouring into ice/water (150/150), air oxidation of the *leuco*-compound, filtration, hot-water washing and final re-crystallisation from conc. H_2SO_4 follow. An earlier patent, *BP* 298,284 (J.S.D.C., 45, 23 (1929)) describes a blue vat dye which is the Bz-2-phenylbenzanthrone-pyrazoleanthrone but the dyes of the present invention which contain an alkyl group in the Bz nucleus have not been previously described. E.T.

Quinophthalone Disperse or Basic Dyes
DuP *USP* 2,818,409

Yellow disperse dyes, which may be converted to cationic (basic) dyes by reaction with tertiary bases and separation as $ZnCl_2$ double salts, are of formula—



(X = Hal; Y, Z = H, Cl, Br or CH_3). The disperse dyes are suitable for dyeing hydrophobic fibres in general whilst the cationic dyes

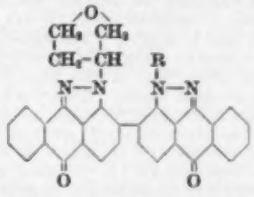


(Q = nucleus of a 3′-hydroxyquinophthalone; B = $NR^1R^2R^3$, where $R^2 + R^3$ = alk or hydroxyalk and R^1 = alk, hydroxyalk or aralkyl of > 4 C; X = Hal) are suitable for *N*-containing fibres, e.g. nylon, polyacrylonitrile, and wool when applied from baths of pH 3–8. The dyes are made, e.g. by refluxing (108°C.) 4-amino-3′-hydroxyquinophthalone (42·4), $ZnCl_2$ (15), monochlorobenzene (330), isopropanol (32), epichlorhydrin (39) for 2 hr. Cooling to 10°C. and precipitation by adding petroleum hydrocarbons follows. E.T.

Red Pyrazoloanthrone Vat Dyes

General Aniline *USP* 2,817,667

Red dyeings of excellent fastness to chlorine and light are produced from alk. $Na_2S_2O_4$ vats using dyes of formula—

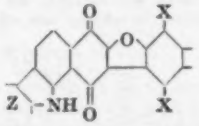


(R = 3-tetrahydrofuryl or Alk of 1–8 C). The dyes are made by treating an alkali metal salt of dipyrazoloanthrone with an ester of 3-tetrahydrofuryl alcohol (preferably a mononuclear arylsulphonic acid ester) in an inert organic solvent. Thus, dipyrazoloanthrone K salt (8·5) is run in a ball-mill with 4-chlorotoluene (21·4) and then mixed with 4-chlorotoluene (48·2) and *p*-toluenesulphonic acid-3-tetrahydrofuryl ester (12·9). Addition of KOH (0·7), agitation at 125°C. for 10 hr. and filtration at 110°C. follow. The product is then washed with (1) 4-chlorotoluene, (2) benzene, (3) acetone and (4) water before drying. The intermediate *p*-toluene sulphonic acid-3-tetrahydrofuryl ester is prepared by adding *p*-toluenesulphochloride (70) at 0°C. to 3-hydroxytetrahydrofurane (29·3) and pyridine (98·2), stiring 2 hr. at 0–5°C., diluting with water (20) below 5°C. and finally precipitating by the addition of ice/water (1200). E.T.

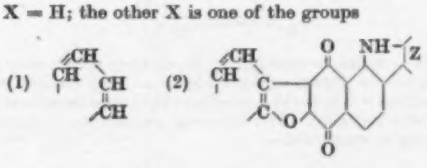
Heterocyclic Vat Dyes

General Aniline *USP* 2,813,875

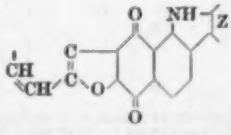
Vat dyes giving brown dyeings of good light-fastness from alk. hydrosulphite vats are of formula—



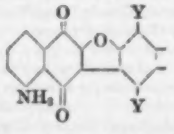
(one X = H; the other X is one of the groups



or (3)



Z = the atoms necessary to complete an anthraquinone structure). The dyes are made by (*a*) reacting a halogenoanthraquinone, which is unsubst. in the *o*-positions to the halogen atoms, with an intermediate of formula—

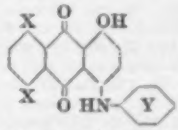


(Y = one of the three groups designated (1), (2) and (3) above) and (*b*) ring closing to form a carbazole ring. Suitable halogenoanthraquinones are 1-chloro-, 1-bromo-1:5 and 1:8-dichloro- or dibromo compounds and these are condensed in reaction (*a*) above in presence of an acid-binding agent, e.g. Na or K carbonate, a Cu catalyst and a diluent, e.g. nitrobenzene trichlorobenzene, etc., at 100–250°C. Reaction (*b*) employs $AlCl_3$, either fused or in an organic solvent, at about 100°C. E.T.

Blue Disperse Dyes for Aromatic Polyesters

ICI *BP* 800,606

Compounds of formula—

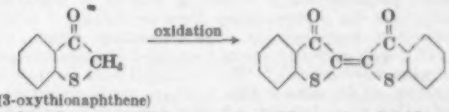


(one X = OH and the other NO_2 or NH_2; the nucleus Y may be substituted by a methyl or methoxy group) dye polyester fibres deep blues of excellent fastness from aqueous dispersions. Thus a 1:1 mixture of 5-amino-4-anilino-1:8-dihydroxyanthraquinone and 5-amino-4-*m*-toluidino-1:8-dihydroxyanthraquinone used as a disperse dye on Terylene yields blues of very good fastness to light, steam pleating, and dry heat. C.O.C.

Thioindigoid Dyes

American Cyanamid Co. *USP* 2,804,464

Earlier methods of preparing thioindigoid dyes by the reaction—



(3-oxythionaphthene)

employed as oxidising agents Na polysulphide, air/$CuSO_4$, K ferricyanide, etc., in aqueous alkaline medium at 90–95°C. Impure products containing, e.g. S or Cu ion and having poor particle size characteristics were obtained. Further processing to remove impurities is expensive and steps taken to improve particle size are not completely effective. The present method uses nitroarylsulphonic acid as the oxidising agent and gives products of particle size $< 1\,\mu$ and readily freed from impurities by water washing. Thus, to a slurry of 6-chloro-4-methyl-3-oxythionaphthene (75) in water (750) and NaOH (12·5) is added K *m*-nitrobenzenesulphonate (20). Heating at 90°C., filtration and washing alkali-free follow. E.T.

Methyl Violet (C.I. Basic Violet 1)

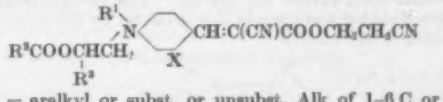
American Cyanamid Co. *USP* 2,816,900

Methyl Violet is normally made by oxidising dimethylaniline in the presence of $CuSO_4$, NaCl and a phenolic substance. Absence of the phenolic body results in low product yields but its presence is objectionable on account of the strong odour it imparts to the finished product. Subsequent purification adds greatly to the cost of manufacture. It is now found that Methyl Violet can be made in good yield if the dimethylaniline is emulsified in the $CuSO_4$–NaCl solution prior to oxidation. Suitable emulsifying agents are alkylol-substituted aliphatic guanidinium *N*-alkylol-substituted aliphatic carbamates, e.g. "Aerosol C61" (ref. *USP* 2,574,510); alkyl amidoalkyl imidazolines, e.g. "Onyxsan S"; polyamino esters and quaternary NH_4 compounds, $R–N(CH_3)_2Cl$; Na alkyl naphthalene sulphonates; oil-sol. petroleum sulphonates and octyl alcohol or dibutyl phthalate. E.T.

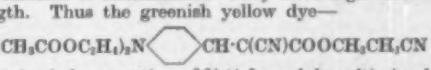
Methin Dyes

General Aniline *USP* 2,811,544

Dyes of formula—



(R^1 = aralkyl or subst. or unsubst. Alk of 1–6 C or $R^3COOCH(R^2)CH_2$; R^2 = Alk; R^3 = H, Alk or acyloxymethyl; X = H or Alk), obtained by condensing cyanoethyl cyanoacetate with suitable *N*-substituted *p*-aminobenzaldehydes in presence of a basic catalyst are yellow to greenish-yellow disperse dyes giving dyeings on cellulose acetate of outstanding fastness to light and washing and good fastness to sublimation. They have high tinctorial strength. Thus the greenish yellow dye—



is obtained by treating $\beta\beta'$-(4-formylphenyl)imino-bisethyl acetate with cyanoethyl cyanoacetate in presence of piperidine. C.O.C.

Phthalocyanine Pigments

DuP *USP* 2,816,045

High resistance to flocculation in coating compositions containing lyophilic organic solvents is obtained with mixtures of Cu phthalocyanine or chlorinated phthalocyanine pigments and 2–15% by weight of an insoluble metal salt of Cu phthalocyanine polysulphonic acid. The metal may be Ba, Mg, Cd, Mn, Zr, Zn, Al or Sn. In an example, a slurry (12 l.) is prepared from a Cu phthalocyanine containing 4% Cl (900 gm.); a commercial Cu phthalocyanine polysulphonic acid (Na salt) of 50% purity containing 2·5 SO_3H groups per mol. (100 gm.) is added and the whole is stirred to dissolve the water-soluble dye. $BaCl_2 \cdot 2H_2O$ (200 gm.) in warm water (2000) is added over 3–5 min. Stirring at room temperature for 1 hr. is followed by filtration, washing to remove water-soluble matter and drying at 60°C. The light fastness and chemical resistance of the products is unimpaired. E.T.

Phthalocyanine Pigments

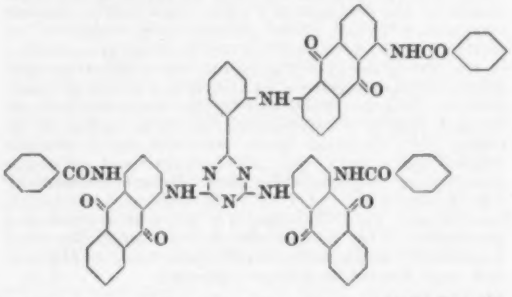
DuP *USP* 2,816,115

Crude phthalocyanine colouring matter is converted directly into the β pigmentary form by milling it with a comminuted water-soluble, solid grinding agent, e.g. fine sand, with sufficient water to convert the mixture into a stirrable viscous mass. The milling should be done in apparatus which causes the mass to undergo internal shear rather than impact, e.g. the disc mill described in *USP* 2,581,414 (J.S.D.C., 68, 323 (1952)). C.O.C.

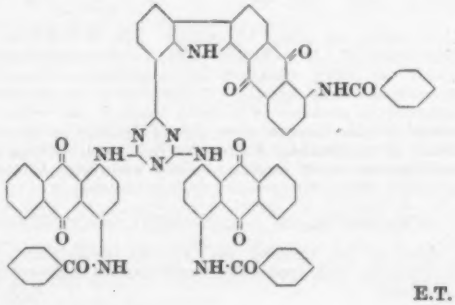
Phthaloylcarbazole Triazine Vat Dye

American Cyanamid Co. *USP* 2,813,863

A vat dye giving fast browns on cellulose from an alkaline hydrosulphite vat at 50°C. is made as follows—2-(*o*-chlorophenyl)-4:6-di(4′-benzamido-1′-anthraquinonylamino)-1:3:5-triazine (2·5), 1-amino-5-benzamidoanthraquinone (4·1), Na_2CO_3 (3) and $Cu.Br_2$ (0·3) are added to molten naphthalene (75) at 100°C. After heating to complete reaction at 205–10°C., the mass is cooled to 150°C. and diluted with chlorobenzene (150). The product obtained by filtration, washing with chlorobenzene and acetone and purified by hot dil. HCl extraction is



This (3·5) is added at 60–65°C. to fused $AlCl_3$ (10) and nitrobenzene (40) and, when reaction is complete, is drowned into excess dil. NaOH. The nitrobenzene is steam distilled and the vat dye obtained by filtration and washing is of formula—



E.T.

Phthalocyanine Pigments

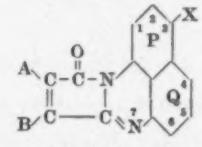
B. F. Goodrich Co. *BP* 799,710

A common method of producing metal phthalocyanines consists of heating, in an inert high-boiling organic solvent, a phthalocyanine-forming material, e.g. phthalic anhydride, a nitrogen donor, a metal salt, e.g. $Cu(NO_3)_2$, to give Cu phthalocyanine, and a catalyst. The catalysts frequently used are (*a*) a metal or metal salt in which the metal is usually different from that of the final phthalocyanine molecule or (*b*) a metal oxide. When such catalysts are employed, it has been observed that (1) yields are considerably less than theoretical; (2) some catalysts require the removal of considerable amounts of water or other material before reaction starts; (3) some are bulky; (4) some are corrosive and (5) some give products which after pasting are dirty or off-shade. The present invention proposes replacing the earlier catalysts by a catalyst comprising (*a*) $\ll 1$ freshly prepared anion-free hydrated gel of a metallic or semi-metallic oxide, or (*b*) $\ll 1$ hydrated material at least partially soluble in the nitrogen donor which is obtainable by digesting a metallic or semi-metallic oxide with a mineral acid or (*c*) $\ll 1$ hydrolysable compound of formula $E-[-OR-]_x-$ (E = element of at. no $\ll 28$ from Group IV, V or VI of the Periodic Table and which is capable of forming an oxide gel; R = organic residue attached to E through $\ll 1$ oxygen atom; x = valency of E). Specially mentioned under type (*a*) are hydrated TiO_2 and hydrated ZrO_2 gels; under type (*b*) are TiO_2 and ZrO_2 digested with H_2SO_4 and under type (*c*) are tetramethyl titanate, $Ti(OCH_3)_4$, tetrabutyl titanate, $Ti(OC_4H_9)_4$ and tetramethyl zirconate, $Zr(OCH_3)_4$. Methods for preparing the three types of catalyst are given and examples illustrate their use in making the phthalocyanine pigments. E.T.

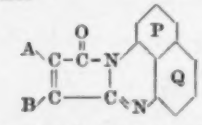
Phthaloperinone Dyes

ICI *BP* 799,607

Orange, red, and maroon dyes of high fastness to light and stability to heat and suitable for colouring plastics for high-temperature moulding are of formula—



(A, B = subst. or unsubst. hydrocarbons which may form a homo- or hetero-cyclic ring; X = acyl radical which may form a ring at the 4-position; P, Q may be substituted, e.g. with halogen). The colouring matters are prepared by heating a compound—



with an anhydride or halide of a carboxylic acid in presence of a condensing agent, e.g. H_2SO_4, $AlCl_3$, $NaAlCl_4$, etc., at 100–200°C. E.T.

Rendering Direct Dyes Readily Soluble

American Cyanamid Co. *USP* 2,812,322

Direct dyes that do not yield the same hue in cold water that they do when properly dissolved, e.g. C.I. Direct Brown 1 and C.I. Direct Orange 15, can be rendered readily soluble in cold water to give dyeings (when added to a paper beater) of strength equal to and often superior to that obtained by dissolving the dyes separately in warm water by milling them in apparatus which grinds by attrition and shearing and not by impact. C.O.C.

Acid Milling of Vat Dyes

General Aniline *BP* 800,704

The dye (1 part), an acid-stable water-soluble inorganic salt (0·5–5·0), e.g. Na_2SO_4, and H_2SO_4, chloroacetic, phosphoric, chlorosulphonic or alkyl sulphonic acid (0·5–2·0) are made into a dough-like mass, milled by shearing action, and the resulting thick magma drowned in water. This results in a product of very fine particle size. C.O.C.

Phthalocyanine Pigments

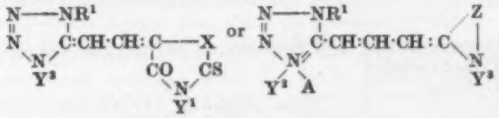
DuP *USP* 2,805,957

A weakness of phthalocyanine pigments in organic coating compositions is that of "flocculation". An instance of the phenomenon is that enamels, paints or lacquers show a different colour when standing to that shown when they are vigorously agitated and this leads to difficulty in obtaining reproducible colouring in actual use. Pigments, highly resistant to flocculation, are claimed which consist of mixtures containing a phthalocyanine which is subject to flocculation and a phthalocyanine substituted with –COOH, $-CONH_2$ or phosphorus acid ($P(OH)_2$). From 2 to 15% of the phthalocyanine molecules in the mixture contain such substituent groups. Examples are given in which non-flocculating mixtures are made (*a*) by condensing phthalic anhydride (121), 4-chlorophthalic anhydride (32), 4-phosphono-phthalic anhydride (7·2) in presence of $CuCl_2.2H_2O$ (44), urea (222), NH_4 molybdate (0·3) and kerosene (800) and (*b*) by partially reacting Cu phthalocyanine (50) in $AlCl_3$ (600) and NaCl (150) with PCl_3 (20) at 150°C. The usual milling and acid-pasting treatments, cf. *USP* 2,556,727 (J.S.D.C., **68**, 191 (1952)) follow. E.T.

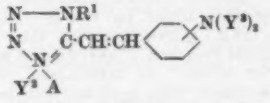
Cyanine, Styryl, and *mero*Cyanine Dyes

FH *BP* 801,275

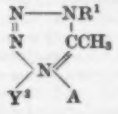
Dyes of formula—



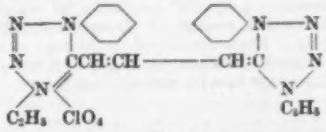
or



(R^1 = Alk or Ar; A = acid group; X = O, S, Se or *N*-alkyl; Y^1 = Alk or alkyl; Y^2 and Y^3 = Alk; Z = atoms to complete a ring) are obtained by known processes using as the cyclammonium compound a quaternary salt derived from a 1:2:3:4-tetrazole and having the formula—



Thus the yellow dye—



is obtained by refluxing for 4 hr. a mixture of 1-phenyl-5-methyl-1:2:3:4- tetrazole-iodoethylate, pyridine, orthoformic acid trimethyl ester, triethylamine and glacial acetic acid, converting into the perchlorate and recrystallising from acetone. C.O.C.

Carbon Black (C.I. Pigment Black 6 and 7)

Deutsche Gold- und Silber-Scheideanstalt *BP* 800,975

Carbon Black readily dispersible in water, acetone, and cellulose nitrate lacquers is obtained if the pigment is treated at 150–340°C. with at least its own weight of superheated steam and then allowed to adsorb ammonia. C.O.C.

Rendering Acidic Carbon Blacks Inert to Driers

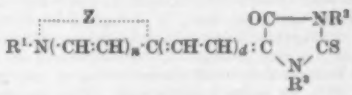
Sherwin–Williams Co. *USP* 2,816,046

Acidic carbon blacks are rendered inert to driers by treating them with organic amines. If a short chain, mono-, di-, or polyamine is used, e.g. monoethylamine, then the pigment is hydrophilic. When a fatty amine is used, e.g. decylamine, then the pigments are hydrophobic. C.O.C.

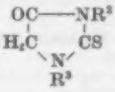
*mero*Cyanine Dyes

Kodak *BP* 800,244

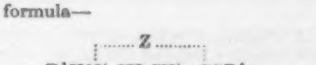
Dyes of formula—



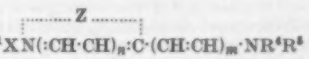
(R^1 = Alk, subst. Alk, alkyl or aralkyl; $n = 0$ or 1; $d = 0$, 1 or 2; Z = atoms to complete a 5- or 6-membered ring) are obtained by condensing a compound of formula—



with one of formula—



or



($m = 1$ or 2; R^4 = acyl; R^5 = Ar). Thus the red 3-ethyl-5-(3-ethylbenzoxazolin-2-ylideneethylidene)-1-(2-pyridyl)-2-thiohydantoin is obtained from 2:2′-acetanilidovinylbenzooxazole ethiodide and 3-ethyl-1-(2-pyridyl)-2-thiohydantoin. C.O.C.

Reducing the Particle Size of Organic Pigments

DuP *USP* 2,816,114

A suspension of an organic pigment or dye and an inorganic salt in a saturated aqueous solution of the salt is subjected to high energy shear and impact treatment in presence of a dispersing agent by means of a surface moving at high speed relative to the body of liquid. Thus Cu phthalocyanine (C.I. Pigment Blue 15) is mixed with 3–10 times its weight of borax and sufficient water, containing a dispersing agent, to give a stirrable mass under vigorous agitation. The mixture is treated for 1–2 hr. in a cylindrical vessel having a single, smooth agitator disc of diameter half that of the vessel and which works at a surface speed of 2,000 ft. per. min. The resulting slurry is diluted to thrice its volume with cold water when the undissolved borax settles as a sludge and can be used for treating a further batch of pigment. The pigment is then isolated by flocculation, filtered, and washed. The resulting pigment paste is useful for colouring paper, coating compositions, aqueous emulsion paints, Portland cement, etc. It can be converted to lakes for colouring linoleum and, when suitably modified, can be flushed into oil to yield high strength flushed pigment paste. C.O.C.

Magnesium Oxide (C.I. 77711)

International Minerals & Chemical Corpn. *USP* 2,809,880

MgO is obtained from a mixture of solid magnesium chloride di- and tetrahydrates by heating it rapidly to decomposition temperature. This is effected without melting the mixture and without it adhering to the walls of the reaction vessel. The HCl gas given off is readily absorbed in water to produce conc. HCl. C.O.C.

Black Manganese–Copper–Iron Pigment

Ferro Corpn. *USP* 2,811,463

A mixture of Mn, Cu, and Fe hydroxides is precipitated from a mixture of water-soluble salts of these elements. The resulting coprecipitate is filtered, washed, dried and then calcined at 800–1400°F. The products have unusual tinting strength and hiding power and are suitable for colouring concrete blocks, cements, plastics, etc. C.O.C.

Molybdate Orange (C.I. Pigment Red 104)

DuP *USP* 2,813,039

Incorporation of a little Na citrate and preferably also about 20% of a water-dispersible clay into the pigment before final drying results in a product which is readily dispersed in water without foaming and is stable during storage. The addition causes little loss in colour value and fastness to light. C.O.C.

Oil Extraction of Bixin (C.I. 75120) from Annatto Seeds

H. M. Barnett and H. M. Espoy *USP* 2,815,287

The natural dyes present in annatto seeds are excellently extracted by agitating them in a vegetable or animal oil, the best extraction being obtained when a fatty acid or fatty alcohol is also present. If the seeds and the attached pulp are first swollen with water or water vapour then a yield of 90% or more is obtained. If a coarse sand is mixed with the seeds while they are being agitated in the solvent then the yield of dye is still further increased. Heating the extract causes rearrangement of the bixin and produces a better colour. C.O.C.

Carbon Black (C.I. Pigment Black 7)

Columbian Carbon Co. *USP* 2,813,009

A method of improving the yield of Furnace Black produced from liquid hydrocarbons. C.O.C.

Silica (C.I. Pigment White 27)

Columbia-Southern Chemical Corpn. *BP* 800,694

Pigmentary silica containing no silica gel is obtained by distributing acid over the surface of an aqueous solution of an alkali metal silicate, e.g. by forming a mist of the acid over the surface, and establishing circulation within the solution by drawing it from the surface into the body of the solution in such a manner that the acid is carried into the main body of the solution.

BP 800,748

Finely divided pigmentary silica is quickly obtained by mixing an acid with an aqueous solution of a metal silicate at such a rate that the stoichiometric amount of acid required to react with the silicate is added within < 10 min. while maintaining the solution at atmospheric pressure and > 100 °c. C.O.C.

Thermoplastic Melamine – Sulphonamide – Formaldehyde Condensates as Bases for Pigments

Switzer Brothers *USP* 2,809,954

The co-condensates of a melamine, an aromatic sulphonamide and an aldehyde can be highly coloured by dyeing them or incorporating pigments into them. Even though thermoplastic they can readily be ground into fine powders at < 100°c. The ground products resist subsequent agglomeration before, during and after dispersion in a film-forming vehicle and have high resistance to settling. They have very low oil absorption characteristic and superior solvent release properties. Their fastness to light is superior to that of other pigments containing the same soluble dyes. C.O.C.

Rôle of Pigments in the Weathering of Automotive Paints (V this page)

Opacification of Enamels, Glasses, and Glazes (V p. 797)

Affinity, Heat of Dyeing, and Entropy Change of Some Red Cotton Dyes (VIII p. 801)

Absorption Spectra and Substantivity to Cotton of Congo Red (C.I. Direct Red 28) and Related Structures (VIII p. 801)

Dyeing Polyester Fibres with Phthaloperinones and Naphthaloperinones (VIII p. 804)

Diazonium Processes (IX p. 805)

Increasing the Photosensitive Properties of some Cyanine Dyes (IX p. 806)

Paper Chromatography of Azoic Coupling and Diazo Components (XIV p. 811)

Colorimetric Determination of C.I. Azoic Coupling Component 2 and Affinity of C.I. Azoic Coupling Component 2 for Cotton (XIV p. 811)

Paper Chromatography of Reduction Product of Azoic Pigments (XIV p. 811)

Separation of Chlorophylls (C.I.75810) by Paper and Cellulose Column Chromatography (XIV p. 812).

V— PAINTS; ENAMELS; INKS

Pigment–Vehicle Interface

A. C. Zettlemoyer

Off. Dig. Fed. Paint Varn. Prod. Cl., **29**, 1238–1271 (Dec. 1957)

Despite its vastness the pigment–vehicle interface in paints and inks (ca. 2·5 acres per lb. of a book ink) has not received much scientific attention. Methods for the measurement of the extent of the interface are discussed— by N adsorption; by water vapour adsorption; and from electronmicrographs, taking into account the shape of the pigment particles. The energetics of pigment surfaces are discussed at some length in terms of the fundamental significance and applications of heats of immersion; work in this field has been very sparse. The contributions of the vehicle are dealt with under the headings— adsorption from solution; effect of additives on dispersions; and molecular arrangements at interfaces. The effect of varying humidity during dispersion is considered with particular reference to its influence on milling efficiency, the rheological properties of the dispersion, transfer properties during printing, and resistance to weathering. There is evidence that it plays an important rôle in all these connections. Much remains to be done to lock the pigment positively to the vehicle, thus minimising the effects of intruding moisture, and a considerable programme of work along these lines is suggested and detailed. J.W.D.

Determination and Importance of Pigment-Volume Concentration

R. Haug

Deut. Farben-Z., **12**, 139–143 (1958): *Chem. Abs.*, **52**, 13283 (10 Aug. 1958)

The critical pigment–volume concentrations (CPVC) of pigments were determined by the centrifugal method. Thus lacquer (20 g.) pigmented with talc (C.I. Pigment White 26) and red FeO (C.I. 77489) diluted with butanol is centrifuged for 20 min. at 3000 r.p.m. and decanted. The residue is mixed with 5–10 ml. butylacetate, transferred to a graduated tube and centrifuged 2×10 min. at 3000 r.p.m. The sediment volumes of the pigment mixture agreed well with results of the cell method. Since the highest CPVC was obtained with pure FeO, no particle packing occurs as in TiO_2 (C.I. Pigment White 6)-extender mixtures. The CPVC of emulsion and dispersion paints can be determined indirectly from tensile strength, stiffness, and elongation of films. Film hardness (penetration and pendulum) shows a maximum at the CPVC. The wetting volume of a pigment by various liquids can be converted and related to CPVC of pigment cakes from the corresponding solvent as determined by the cell method. The binder-pigment system at the CPVC represents a special condition at which some of the film properties change in steps either favourably or unfavourably. Formulation of multi-coat systems must take into account the decrease in pigment-volume concentration of the base film by the topcoat binder. C.O.C.

Rôle of Pigments in the Weathering of Automotive Paints

S. B. Twiss, W. L. Weeks, and F. O. Thomas

Off. Dig. Fed. Paint Varn. Prod. Cl., **30**, 788–823 (Aug. 1958)

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Opacification of Enamels, Glasses, and Glazes
W. W. Cofleen

Ceram. Ind., **70** (4), 120–123, 173 (1958): *Chem. Abs.*, **52**, 13213 (10 Aug. 1958)

A discussion of the properties of heterogeneous systems which influence opacity. The spectrophotometer measures a curve of diffuse reflectance *vs.* wavelength as compared with MgO. The tristimulus reflectometer measures reflectance with three different filters to characterise the reflected light. Particle size, *n*, vol.ratio, and degree of dispersion of the opacifier are considered.

Ibid. (5), 76–77, 81

The factors affecting the degree of opacity include depth of coating, nature of the substrate, reflectivity, and coefficient of scatter. The opacifiers used in the investigation are $ZrSiO_4$ (C.I. 77995), SnO_2 (C.I. Pigment White 15), NaF, CaF_2, TiO_2 (C.I. Pigment White 6), and $Ca_4F_2Sb_4O_{13}$.
C.O.C.

Action of Ultraviolet-screening Agents in Organic Coatings
C. D. Miller

Off. Dig. Fed. Paint Varn. Prod. Cl., **30**, 612–619 (June 1958)

The action of ultraviolet-screening agents in protecting organic coatings against photodegradation can be approximated mathematically. The expected increase in service life is determined by the ultraviolet spectra of the additive and of the organic film, the concentration of additive, and the film thickness. Such additives are more useful for thick films than thin ones, and for clear rather than pigmented coatings. Screening agents produce greater relative effect when used with polymers of low absorptivity and a high quantum yield for degradation. Polymers that absorb strongly in the ultraviolet show much less relative improvement. By the method given the probable suitability of particular formulations and the optimal concentration of screening agent may be assessed, and cost balanced against expected performance. J.W.D.

PATENTS

Aluminium Paints
National Research Development Corpn. *BP* 801,986

Metal powder containing $\leq 70\%$ by weight of aluminium and containing no antipyrophoric lubricant, e.g. stearic acid or stearates, is abraded until any insulating film around the pigment particles has been broken down sufficiently to allow electrical conductivity in a dried paint film containing the powder. The abrading is carried out under conditions which prevent reoxidation of the surface of the metal powder. Paints pigmented with such a powder yield dried films in which there is electrical contact between the pigment particles. C.O.C.

Pigment Dispersions
FH *BP* 801,522

Stable aqueous pigment dispersions are obtained by kneading a hydrous pigment press cake with an acid resin in neutral or acid medium, removing the water which separates out and then treating with aqueous alkali, preferably ammonia, to produce change of phase in the dispersion. C.O.C.

Epoxy Resins as Binders in Paints
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In making paints containing epoxy resins as binders by mixing equal volumes of two liquids, one containing all the resin and the other all the catalyst, each liquid is differently pigmented so that when mixed they produce the colour desired. This enables easy control of the mixing of the two liquids so that uniform hardening of the resin is ensured. C.O.C.

Emulsion Paint based on Chlorosulphonated Ethylene Polymers
DuP *USP* 2,809,950

An aqueous latex of a chlorosulphonated polyethylene is rendered alkaline after which there is added to it a polyvalent metal compound as curing agent, e.g. MgO, and an opacifying pigment. Such a paint yields coatings which dry rapidly at ordinary temperatures to yield films of high resistance. C.O.C.

Benzyl Dextrans in Making Non-hygroscopic Lacquers
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A blend of a benzyl ether of a dextran and an ester of a dextran with a fatty acid of 8–18 C, the ester containing 2–3 fatty acid radicals per anhydroglycopyranoidic unit, dissolved in an organic solvent yields a lacquer which rapidly dries to give non-hygroscopic, brilliant, hard, tenaciously adherent, durable coatings. C.O.C.

Black Coatings for Metal
Raytheon Manufacturing Co. *USP* 2,814,574

A suspension of TiO_2 and nickel or iron oxide in a mixture of a cellulose nitrate binder and a wetting agent is applied and then the coated metal is heated at 1300–1350°C. in a reducing atmosphere preferably of pure, dry hydrogen. This leaves a pure coating of metal oxides.
C.O.C.

Colouring Compositions for Hectograph Inks
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The viscosity of hectograph inks is reduced and kept stable even when hot by using as the colouring composition a mixture of a suitable dye, e.g. Crystal Violet (C.I. Basic Violet 3), with a dialkylketone containing a straight chain of > 6 C, e.g. commercial stearone. C.O.C.

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A mixture of Carbon Black (C.I. Pigment Black 6 and 7) is mixed with a resinous liquid vehicle in such proportions that the mixture is flocculated to such a degree that it will not pass the ball point when the pen is not in use but when subject to the shearing action of the ball point, as it rotates during writing, becomes sufficiently deflocculated as to pass the ball point and then reflocculate on the surface being written upon. 8 examples of such compositions are given. They produce the same sort of impressions as do lead pencils and are similarly erasable but nevertheless are smear and smudge-proof.
C.O.C.

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VI—FIBRES; YARNS; FABRICS

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A. Wilhelm

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Ultrathin microtome sections of cottons of different origin embedded partially swollen in polybutyl methacrylate yield electron-micrographs which confirm and extend earlier findings that the fibre consists largely of concentric lamellae, corresponding to days of growth, themselves composed of bands built up from clusters of cellulose fibrils, interspersed with a little material showing a reducing action on osmium tetroxide. S.M.J.

Sugar, pH, and Strength Changes in Cotton during Storage
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Measurements were made on several sets of cotton stored under 8 different conditions of temp. and R.H. No significant changes in the strength occurred, and the distribution of sugar and pH changed only under those conditions which resulted in considerable microbiological growth (50–85°F. and 85–90% R.H.). The data showed that sugar and pH changes were not closely connected with the normal yellowing of cotton with age.
S.B.D.

Oil Extraction of Bixin (C.I. 75120) from Annatto Seeds

H. M. Barnett and H. M. Espoy *USP* 2,815,287

The natural dyes present in annatto seeds are excellently extracted by agitating them in a vegetable or animal oil, the best extraction being obtained when a fatty acid or fatty alcohol is also present. If the seeds and the attached pulp are first swollen with water or water vapour then a yield of 90% or more is obtained. If a coarse sand is mixed with the seeds while they are being agitated in the solvent then the yield of dye is still further increased. Heating the extract causes rearrangement of the bixin and produces a better colour. C.O.C.

Carbon Black (C.I. Pigment Black 7)

Columbian Carbon Co. *USP* 2,813,009

A method of improving the yield of Furnace Black produced from liquid hydrocarbons. C.O.C.

Silica (C.I. Pigment White 27)

Columbia-Southern Chemical Corpn. *BP* 800,694

Pigmentary silica containing no silica gel is obtained by distributing acid over the surface of an aqueous solution of an alkali metal silicate, e.g. by forming a mist of the acid over the surface, and establishing circulation within the solution by drawing it from the surface into the body of the solution in such a manner that the acid is carried into the main body of the solution.

BP 800,748

Finely divided pigmentary silica is quickly obtained by mixing an acid with an aqueous solution of a metal silicate at such a rate that the stoichiometric amount of acid required to react with the silicate is added within < 10 min. while maintaining the solution at atmospheric pressure and > 100 °c. C.O.C.

Thermoplastic Melamine – Sulphonamide – Formaldehyde Condensates as Bases for Pigments

Switzer Brothers *USP* 2,809,954

The co-condensates of a melamine, an aromatic sulphonamide and an aldehyde can be highly coloured by dyeing them or incorporating pigments into them. Even though thermoplastic they can readily be ground into fine powders at < 100°c. The ground products resist subsequent agglomeration before, during and after dispersion in a film-forming vehicle and have high resistance to settling. They have very low oil absorption characteristic and superior solvent release properties. Their fastness to light is superior to that of other pigments containing the same soluble dyes. C.O.C.

Rôle of Pigments in the Weathering of Automotive Paints (V this page)

Opacification of Enamels, Glasses, and Glazes (V p. 797)

Affinity, Heat of Dyeing, and Entropy Change of Some Red Cotton Dyes (VIII p. 801)

Absorption Spectra and Substantivity to Cotton of Congo Red (C.I. Direct Red 28) and Related Structures (VIII p. 801)

Dyeing Polyester Fibres with Phthaloperinones and Naphthaloperinones (VIII p. 804)

Diazonium Processes (IX p. 805)

Increasing the Photosensitive Properties of some Cyanine Dyes (IX p. 806)

Paper Chromatography of Azoic Coupling and Diazo Components (XIV p. 811)

Colorimetric Determination of C.I. Azoic Coupling Component 2 and Affinity of C.I. Azoic Coupling Component 2 for Cotton (XIV p. 811)

Paper Chromatography of Reduction Product of Azoic Pigments (XIV p. 811)

Separation of Chlorophylls (C.I.75810) by Paper and Cellulose Column Chromatography (XIV p. 812).

V— PAINTS; ENAMELS; INKS

Pigment-Vehicle Interface

A. C. Zettlemoyer

Off. Dig. Fed. Paint Varn. Prod. Cl., **29**, 1238–1271 (Dec. 1957)

Despite its vastness the pigment–vehicle interface in paints and inks (ca. 2·5 acres per lb. of a book ink) has not received much scientific attention. Methods for the measurement of the extent of the interface are discussed— by N adsorption; by water vapour adsorption; and from electronmicrographs, taking into account the shape of the pigment particles. The energetics of pigment surfaces are discussed at some length in terms of the fundamental significance and applications of heats of immersion; work in this field has been very sparse. The contributions of the vehicle are dealt with under the headings— adsorption from solution; effect of additives on dispersions; and molecular arrangements at interfaces. The effect of varying humidity during dispersion is considered with particular reference to its influence on milling efficiency, the rheological properties of the dispersion, transfer properties during printing, and resistance to weathering. There is evidence that it plays an important rôle in all these connections. Much remains to be done to lock the pigment positively to the vehicle, thus minimising the effects of intruding moisture, and a considerable programme of work along these lines is suggested and detailed. J.W.D.

Determination and Importance of Pigment-Volume Concentration

R. Haug

Deut. Farben-Z., **12**, 139–143 (1958): *Chem. Abs.*, **52**, 13283 (10 Aug. 1958)

The critical pigment–volume concentrations (CPVC) of pigments were determined by the centrifugal method. Thus lacquer (20 g.) pigmented with talc (C.I. Pigment White 26) and red FeO (C.I. 77489) diluted with butanol is centrifuged for 20 min. at 3000 r.p.m. and decanted. The residue is mixed with 5–10 ml. butylacetate, transferred to a graduated tube and centrifuged 2×10 min. at 3000 r.p.m. The sediment volumes of the pigment mixture agreed well with results of the cell method. Since the highest CPVC was obtained with pure FeO, no particle packing occurs as in TiO_2 (C.I. Pigment White 6)-extender mixtures. The CPVC of emulsion and dispersion paints can be determined indirectly from tensile strength, stiffness, and elongation of films. Film hardness (penetration and pendulum) shows a maximum at the CPVC. The wetting volume of a pigment by various liquids can be converted and related to CPVC of pigment cakes from the corresponding solvent as determined by the cell method. The binder-pigment system at the CPVC represents a special condition at which some of the film properties change in steps either favourably or unfavourably. Formulation of multi-coat systems must take into account the decrease in pigment-volume concentration of the base film by the topcoat binder. C.O.C.

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S.B.D.

Colour Change in Raw Cotton related to Conditions of Storage
D. Nickerson and J. J. Tomaszewski
Text. Research J., **28**, 485–497 (June 1958)

Changes of colour of several sets of cotton stored under 14 different conditions of temp. and R.H. are recorded, covering the first year of a three-year study. The temp. ranged from 0°F. to 100°F., and the R.H. was 85–90% or 50%. The results are somewhat complicated by the presence of *Penicillium* mould from adjacent stored vegetables, but they show that the usual yellowing of the cotton is retarded by either low temp., low R.H., or a combination of both. It is suggested that standard conditions of 50°F. and 50% R.H. be specified for the storage of the cotton grade standards. S.B.D.

Effect of Nuclear Radiation on Fibrous Materials. III— Relative Order of Stability of Cellulosic Fibres
O. Teszler, L. H. Kiser, P. W. Campbell, and H. A. Rutherford
Text. Research J., **28**, 456–462 (June 1958)

Cotton, rayon, and cellulose acetate yarns were exposed for different periods of time to thermal neutrons and to γ rays (^{60}Co). The results showed that the total dosage was the deciding factor in the extent of change in physical properties of the yarns and that γ rays alone had essentially the same effect as thermal neutrons when their energies were equated. The decreasing order of stability was cellulose acetate, rayon, and cotton, the data suggesting that there were linkages in the native cellulose susceptible to radiation that were not present in the regenerated materials. S.B.D.

Inherent Resistance of Wool
I. Asboth, B. Mihalik, and G. Zoltán
Textil-Praxis, **13**, 659–664 (July 1958)

Evidence is presented to show that some forms of latent damage in wool, which are detectable by chemical methods, are not revealed by mechanical tests until the wool has been processed during the course of converting the fibres into yarns and finished fabrics. The reasons for this phenomenon are to be found in the postulated inherent resistance of wool, which varies with the origin and the quality of the fibre. L.A.T.

Mechanism of the Reaction between Cystine in Keratin and Sulphite–Bisulphite Solutions at 50°C.— II
P. T. Speakman
Biochim. Biophys. Acta, **28**, 284–293 (May 1958)

Further experiments are consistent with the mechanism of bisulphite-stable cross-linkage formation in keratin treated with sulphite–bisulphite solutions in 10% C_2H_5OH for 1 hr. which was advanced previously (Part I, *Ibid.*, **25**, 347 (1957)). Load–extension curves of keratin fibres and data from the changes in X-ray diffraction pattern as they are extended, when taken with the curves of set versus extension-before-treatment, suggest that some at least of the cross-linkages are formed within the originally inaccessible region of the fibre which has been made accessible to the reactive ions in the solution when the fibre is extended. There is no evidence of the formation of bisulphite-stable cross-linkages in unextended fibres either in the presence or absence of a swelling agent, LiBr. Recent work tends to show that the accessible and inaccessible regions of keratin have different amino-acid compositions. Lysine, the source of the nitrogen atom in the –CH:N– linkage, seems to be present only in the accessible region, so that lanthionine, R·S·R, is the most likely bisulphite-stable cross-linkage in the inaccessible region. P.G.M.

Felting Investigations. I— Potential Substitutes for Rabbit Fur in Hat Felts
R. D. B. Fraser and T. A. Pressley
Text. Research J., **28**, 478–485 (June 1958)

Uncertainties in the supply of rabbit fur for hats led to enquiries regarding the use of other fibres for fur felts whilst still following existing techniques. From examination of the felting characteristics and histological structures of a number of possible alternatives it was concluded that opossum, fox, and wallaby fur might be blended in considerable proportions with rabbit fur without seriously affecting the quality of the felt, and that mutant merino wool could be used in small proportions. S.B.D.

Thermodynamic Properties of the System Wool Keratin–Water Vapour
J. L. Morrison and J. F. Hanlan
Proc. 2nd Internat. Congress Surface Activity, **2**, 322–329 and 342–343 (1957)

The heats of wetting by water of wool keratin initially containing various amounts of adsorbed and desorbed water were measured at 24·6°C. No hysteresis was observed. The thermodynamic properties of the system were calculated from this data and the water vapour sorption isotherm. The differential heats of entropies suggest that an appreciable amount of energy is used to swell the intermolecular structure of the lowest moisture contents. Adsorption area measurements suggest that at the higher moisture contents the water molecules form clusters on the wool surface instead of a continuous film as in the case of silk and cellulose. W.K.R.

Variability of Set in Keratin Fibres
T. Mitchell and M. Feughelman
Text. Research J., **28**, 453–456 (June 1958)

The amount of "permanent" set in a number of keratin fibres was measured, the fibres being strained 40% for 1 hr. in distilled water at 100°C. and then released slack for 1 hr. in the water. The variation in the amount of set retained was noted. The fibres included wool from ten different sheep, three lots of human hair, and one lot of mohair. The amount of set retained appeared to correlate strongly with the ability of the fibre to supercontract and tends to be dependent on the fibre diameter. S.B.D.

Structure of Keratin. III— Reaction of Wool and Horn Keratins with Solutions of Sodium Hypochlorite
C. Earland and D. J. Raven
Biochim. Biophys. Acta, **27**, 41–45 (Jan. 1958)

Cystine analyses have been performed on wools of different fibre diameters and horn after being ground to different particle sizes, after reaction with solutions of sodium hypochlorite. It is considered that the reaction of keratins with solutions of hypochlorite does not establish the existence of two cystine fractions of different reactivities, and it is shown that these results may arise from the use of a non-specific oxidant for the disulphide bond, followed by solution of the oxidised protein. P.G.M.

Amino-acid Composition of Three Fractions from Oxidised Wool
M. C. Corfield, A. Robson, and B. Skinner
Biochem. J., **68**, 348–352 (Feb. 1958)

An Australian merino 64s-quality wool has been oxidised with peracetic acid and its amino-acid composition determined. The analysis is in excellent agreement with that of virgin wool (*ibid.*, **59**, 62, 1955), except that cystine is converted into cysteic acid and that small losses of histidine, tyrosine, and phenylalanine occurred. α-, β- and γ-Keratoses were prepared from oxidised wool and their amino-acid composition determined. Only 75% of the total sulphur of oxidised wool and the 3 keratoses could be accounted for by their respective cysteic acid contents. The total nitrogen and total sulphur of the 3 keratoses have been compared with the amounts determined by other workers. For total sulphur the agreement is not good. P.G.M.

Reaction Spinning of Fibres
H. A. Pohl
Text. Research J., **28**, 473–477 (June 1958)

In reaction spinning, the usual viscosity increase required between spinneret and windup is accomplished by chemical reaction. Incompletely polymerised or incompletely solubilised polymer is forced through the spinneret under such conditions of rate, temperature, concentration, and activation that the polymerisation proceeds rapidly within the fibre after leaving the spinneret, enabling it to be wound up on a package, where further reaction will complete the transformation to the required fibre properties. Principles and experimental examples of the process are described. S.B.D.

Polyamide and Polyester Fibres— General
H. Hopff and G. Greber
Ciba Review, **11**, 2–8 (July 1958)

Manufacture of Polyamide and Polyester Fibres
Idem
Ibid., 9–16

Properties and Uses of Polyamide and Polyester Fibres
Idem
Ibid., 17–24

Status of Synthetic Fibres in the Textile Field
H. U. Schmidlin
Ibid., 25–29

New Synthetic Fibres
E. Frieser
S.V.F. Fachorgan, **13**, 257–265 (May 1958)

A review of methods of preparation and properties of the newer synthetic fibres. Examples — polyvinylidene cyanide (Darvan, Goodrich Chemical Co., U.S.A.), tetrafluoroethylene (Teflon, DuP; Ftorlon, U.S.S.R.), mixed polymers of acrylonitrile and vinylidene chloride (Zefran, Dow Chemical Corpn., U.S.A.; Saniv, U.S.S.R.). Reference is made to the British Celanese polyalkene–aminotriazole fibre. L.A.T.

Development and Properties of Blends of Polyester with Other Fibres
J. Monheim
Melliand Textilber., **39**, 888–892 (Aug. 1958)

Fabrics available in different countries are listed. Most favoured are blends containing 45% wool; 35% cotton, rayon, or linen, showing good crease resistance; or 30% or more of nylon. S.M.J.

Synthesis and Structure of Fibre-forming Polymethylene Sulphones and Evaluation of such a Polysulphone Fibre
H. D. Noether
Text. Research J., **28**, 533–541 (July 1958)

The synthesis and evaluation of fibre forming polymethylene sulphones has shown a new type of structure giving a high-temperature resistance. The crystalline melting points of these polymers are very similar to those of the corresponding polyamides, except that they show a linear behaviour rather than a zig-zag pattern of m.p. dependence on unit length. The fibre forming characteristics of the polysulphones, their crystalline character and thermal behaviour are as expected for a high-mol.wt. linear polymer based on a polymethylene chain with replacements of $>CH_2$ groups by more polar units at regular intervals. Unlike those polysulphones formed by the polymerisation of olefins with sulphur dioxide, which are alkali sensitive, these polymers are inert to hydrolysing agents. The dyeing affinity of the fibres is similar to that of cellulose acetate and they can be heat-set. The difficulties in large-scale production of these polysulphones are mainly due to the absence of economic raw materials. S.B.D.

PATENTS

Cellulosic Solutions containing Flame-retardant Agents
Monsanto *USP* 2,816,004

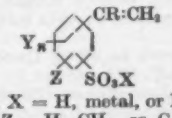
An aqueous solution of cellulose containing a neutral to alkaline reaction product of phosphoryl chloride and ammonia is used for producing flame-resistant filaments, coatings, etc. C.O.C.

Linear Polycondensate or Polymer Fibres having Antistatic Properties
Vereinigte Glanzstoff-Fabriken *BP* 801,727

Modification of *BP* 796,800 (J.S.D.C., **74**, 668 (Sept. 1958)). The substituted methane or ethane derivatives are added to the polycondensate or polymer before thread formation. C.O.C.

Acrylic Fibres of Good Affinity for Disperse, Basic, and Vat Dyes
Dow Chemical Co. *BP* 801,420

A copolymer of 99–90% of acrylonitrile and 1–10% of compound of the formula—



($R = H$ or CH_3; $X = H$, metal, or NH_4; $Y = Cl$ or Br; $n = 0$, 1, or 2; $Z = H$, CH_3, or C_2H_5), e.g. sodium *p*-styrene sulphonate, can be formed into fibres which are readily dyed with disperse, basic, and vat dyes. C.O.C.

Keratin Solutions suitable for forming Fibres
Rubberset Co. *USP* 2,814,851

Natural keratinous matter, e.g. fowl feathers, is heated with a solvent for keratin in presence of a reducing disulphide-splitting agent. The resulting solution is filtered off, cooled and the precipitated keratin dried. This dried keratin is then treated with a keratin solvent, preferably different from that used above, to yield a viscous solution suitable for spinning or extrusion. C.O.C.

Solvent for Synthetic Linear Condensation Polymers (III p. 786)
Phototendering by Anthraquinone-2:6-disulphonic Acid of Cotton Duck before and after Weathering (VIII p. 802)
Preventing Regenerated Cellulose from Yellowing in presence of Heat and Moisture (X p. 808)
Twist Set of Wool Fibre Bundles (XIV p. 812)

VII— DESIZING; SCOURING; CARBONISING; BLEACHING

Rate of Wetting of Textiles by Detergent Systems
K. Durham and M. Camp
Proc. 2nd Internat. Congress Surface Activity, **4**, 3–11 and 148–149 (1957)

In an apparatus for the accurate measurement of the rate of wetting of cotton cloth by detergent solutions, three electrodes, one of which is positioned in the centre, bear against the upper surface of the fabric. The assembly is lowered to contact, at the centre, a capillary tube containing the solution. As wetting proceeds from the central electrode to the nearest electrode it provides a conducting path and the current is used to actuate a timing device, which is stopped when the solution reaches the third electrode. An attempt has been made to analyse the process of wetting a fibrous mass, and equations for surface tension as a function of time have been introduced into the Rideal–Washburn equation prior to integration. The equations so developed are compared with experimental results. The diffusion of surface-active material is a rate determining process in the wetting of capillary systems, such as cotton fabric, by detergent solutions. Cotton soiled with fat and particulate matter is difficult to wet, and the results are too complex for detailed analysis. W.K.R.

Aqueous Dispersions of Carbon Black (C.I. Pigment Black 7)
H. G. Wagner
Proc. 2nd Internat. Congress Surface Activity, **4**, 113–118 and 158–160 (1957)

Sodium dibutylnaphthalenesulphonate was the most suitable of six products examined for dispersing carbon black (I) in water; non-ionics were also satisfactory. Excess dispersing agent impairs the fineness of dispersion. Dispersions of I prepared under optimum conditions with anionic agents caused some of I to be deposited on cotton cloth in a form resistant to washing. It is considered that in washing normally soiled fabrics, excess dispersing agent is usually present in relation to the amount of I type soil, and thus I does not become finely dispersed and fixed to the fibre; but if insufficient soap or detergent is present optimum dispersion may be achieved and cause greying which is resistant to subsequent washing. Non-ionics are superior to anionics in this respect. W.K.R.

Rôle of Surface-active Agents in Processes for Dispersing Solids in Liquid Media
J. L. Moilliet
Proc. 2nd Internat. Congress Surface Activity, **4**, 162–167 and 238 (1957)

The two basic effects, i.e. the lowering of interfacial tensions, and the formation of interfacial barrier layers, which are achieved by the adsorption of surface-active agents at solid/liquid interfaces, are discussed. The functions of surface active-agents in aiding the preparation of dispersions by mechanical disintegration and by controlled precipitation, in stabilising dispersions and in the "flushing" of pigment particles from aqueous media into an oil, are examined in terms of these effects. W.K.R.

Particle Size and Detergency
T. H. Shuttleworth and T. G. Jones
Proc. 2nd Internat. Congress Surface Activity, **4**, 52–59 and 156–157 (1957)

Preliminary experimental results support theoretical conclusions that the tendency of particles to deposit on fibres increases with decreasing particle size. Electron-microscopic examination of cotton fibres soiled with carbon blacks of small particle size did not support the view that micro-occlusion on the fibre surface is the main mechanism of soil retention. W.K.R.

Interfacial Effects of Calcium Ions in Detergency
A. S. Porter
Proc. 2nd Internat. Congress Surface Activity, **4**, 103–112 and 157–158 (1957)

Some of the ways in which hard water can affect the washing of cotton and rayon fabrics with synthetic anionic detergents, have been studied. The presence of Ca in the water increases the deposition of dispersed mineral oil and kaolin, and thus lowers the efficiency of washing. After rinsing in soft water the carboxyl groups of cellulosic fibres are almost saturated with Ca which will exchange with Na ions in the next wash liquor, so that this can be rendered sufficiently hard to interfere with detergency. This defect may be remedied by incorporating in the detergent mixture a compound that will precipitate or preferably sequester the Ca. W.K.R.

Action of Sodium Carboxymethylcellulose in Washing Baths
K. J. Nieuwenhuis and K. H. Tan
Proc. 2nd Internat. Congress Surface Activity, **4**, 12–24 and 149–152 (1957)

From a critical review of the literature and the results of additional experimental work, it is concluded that whilst no valid proof has yet been given for the adsorption of sodium carboxymethylcellulose (NaCMC) on normal types of soil, it has not been disproved that at least part of the constituents of commercial NaCMC is adsorbed, reversibly or irreversibly, on washed and bleached cotton. Further work is required, therefore, to establish whether the soil suspending power of NaCMC is mainly due to interaction with the fabric or with the soil. W.K.R.

Relation between Dirt Removal and Fibre and Fabric Substrate
R. E. Wagg
Proc. 2nd Internat. Congress Surface Activity, **4**, 43–51 and 154–156 (1957)

Washing tests were carried out with artificially soiled natural and man-made textiles in the form of chopped fibres and fabrics of various constructions. The extent of soil removal was found to depend on the nature of the fibre, the construction of the fabric, and the type of detergent used. It was also influenced by impurities in and finishes on the fibres and fabrics. W.K.R.

Influence of Interfacial Electric Conditions on the Deposition of Soil Particles on to Cotton from Detergent Solutions
K. Durham
Proc. 2nd Internat. Congress Surface Activity, **4**, 60–69 and 157 (1957)

A qualitative correlation is shown to exist between the calculated interfacial electrical conditions in detergent systems (with and without builders) and the stability against deposition of soil on the fibre. The latter is also influenced by factors other than electrical repulsion, such as a mechanical barrier due to a solvated layer around the particles and a barrier due to steric effects of adsorbed ions. W.K.R.

Soiling Cellulose Hydrate Fibres. II—Optical and Electron-microscopic Investigations
W. Bandel
Melliand Textilber., **39**, 800–803 (July 1958)

Optical and electron micrographs illustrate the findings in Part I that carpets of viscose rayon fibres of circular cross-section, such as Floxan, pick up far less dirt and are more readily cleaned than the more usual viscose rayon fibres, in which dirt accumulates preferentially in the serrations. Dirt-repellent finishes do not obliterate these differences. Comparative photomicrographs of wool are given. S.M.J.

Water Absorption and Drying of Untreated, Laundered or Used and Laundered Cotton and Linen Towelling
F. E. Petzel
Amer. Dyestuff Rep., **46**, 569–574 and 576 (12 Aug. 1957)

Cotton and linen towelling were subjected to cycles of laundering or of use and laundering, after which their breaking strengths, rates of drying, or moisture absorption were studied after 20, 40, or 60 such cycles. Whereas cotton towelling decreased little in breaking strength and took up more moisture than linen towelling, the latter was found to be more moisture-absorbent when approaching saturation. The linen towelling also showed an increase in absorbency with increasing laundering up to a certain point, after which it fell, corresponding to a decrease in weight of the fabric. The linen took slightly longer to dry than the cotton during the first 2 periods of service, but during the last period this was reversed. L.P.

Surface of Cotton Fibres. IV—Distribution of Dry Soil
V. W. Tripp, A. T. Moore, B. R. Porter, and M. L. Rollins
Text. Research J., **28**, 447–452 (June 1958)

The location of soiling agents such as carbon black, floor soil, synthetic soil, and clay on grey and modified plain-weave cotton fabrics was determined by both light and electron microscopy. The mechanical entrapment of soil particles between fibres near the surface of the fabric is repeated in the accumulation of soil in the natural or induced irregularities of the fibre surfaces. The presence of soft films on the fibre surface extends the quantity of soil and its distribution. Sorption of soil particles on apparently smooth areas of the fibre also occurs to a significant extent. S.B.D.

Chemistry of Wool Scouring
D. Hildebrand and H. Zahn
S.V.F. Fachorgan, **13**, 376–385 (June 1958)

It is postulated that controlled commercial scouring of wool with soap and soda ash does not lead to deterioration of fibre properties. On the contrary, the resistance of wool scoured under alkaline conditions (pH $<$ 10·5, temp. $<$ 50°c., time $<$ 90 min.) shows increased resistance to the action of alkalis and reducing agents. This surprising fact came to light in the course of fundamental research and it can be explained in terms of spontaneous cross-linking of the wool protein which, under mildly alkaline conditions, is catalysed by the cysteine residues. L.A.T.

Wool Scouring
H. Meyer
Melliand Textilber., **39**, 639–642 (June 1958)

Neutral scouring techniques for raw wool, dearer than scouring with soap and soda, yield a better product. Anionic synthetic detergents give a better handle than the less substantive non-ionics, but greater quantities are required. Whilst neutrally applied synthetic detergents are slightly more efficient, alkaline soap is much less efficient in removing the fat from freshly shorn wool than from stored wool, the fat in which contains more saponifiable free fatty acid. Menzinger's criticisms (*ibid.*, **38**, 850 (1957)) of non-ionic detergents in comparison with anionic detergents are contested: the non-ionics do not exhibit any cationic character; the poor handle is not due to their substantivity, which is shown to be very low, but to the "empty" feel of the thoroughly scoured wool, and can be improv d by adding some highly substantive anionic; although the turbidity point, near which they exhibit maximum efficiency, is at a higher temperature than usual in an alkaline wool scour, this can be attained in the less damaging neutral scour. Phosphates and organic protective colloids provide activation. S.M.J.

Recent Developments in Wool Carbonising
W. G. Crowther and T. A. Pressley
Bull. Inst. Text. France, (73), 53–60 (April 1958)

Addition of non-ionic surface-active agents to the acid bowl in carbonising prevents embrittlement of the carbonised wool and thus gives an improved yield and higher tensile strength. Economic implications are discussed. J.C.F.

Automatic Unit for the Continuous Manufacture of Sodium Hypochlorite

D. S. Morton

Amer. Dyestuff Rep., **47**, 372–374 (2 June 1958)

Sodium hypochlorite is produced at the bleach house by a continuous process from soda ash, caustic soda, and liquid chlorine. The unit is turned on at the start of the day and will produce sodium hypochlorite at the rate at which it is being consumed. Soda ash is added to water and brought to the boil in a steel tank. After cooling this solution drops into a concrete tank, and caustic soda is added, followed by liquid chlorine. After 60–90 min. the chlorination is complete and the solution has cooled sufficiently for use. Five or six batches are produced per day. P.T.S.

Laundering of Woven Wool Fabrics in a Modern Home Washing Machine

H. Bogaty and H. E. Harris

Amer. Dyestuff Rep., **47**, 369–371 (2 June 1958)

Shrinkage of wool fabrics in washing machines is reduced by reducing the time of washing and reducing the agitation and spinning. An increase in the water:fabric ratio causes a smaller decrease in felting shrinkage. The water temperature over the range 60–150°F. is not important. In modern American washing machines the agitation and temperature can be controlled, and control of the former seems essential for satisfactory washing of woollen fabrics. P.T.S.

Influence of Air on Hypochlorite Bleaching

I. Rusznák and A. Székely

Melliand Textilber., **39**, 883–885 (Aug. 1958)

Experiments with linen show that intermittent airing raises the whiteness obtained with alkaline sodium hypochlorite because of the lowering of pH towards neutrality by the absorbed carbon dioxide. Damage, depending not only on pH but also on hypochlorite concentration, can be minimised despite an improved bleach. A subsidiary effect is due to atmospheric oxygen, which decomposes hypochlorite, especially when the gas–liquid interface is large, yet always lowers the amount of hypochlorite required to attain a given degree of whiteness. S.M.J.

Chlorite Bleaching of Fabric

V. V. Shtutser

Tekstil. prom., **18**, 44–47 (March 1958)

A review of the principles of chlorite bleaching, with 25 references (mainly foreign). G.J.K.

PATENTS

Corrosion Inhibitor for Use in Chlorite Bleaching Baths

Hercules Powder Co. *USP* 2,810,717

Nitrogen compounds containing at least one H atom attached to the N atom, e.g. $(NH_4)_2SO_4$, act as corrosion inhibitors in chlorite bleaching baths. C.O.C.

Washing and Bleaching Composition for Textiles

Deutsche Gold- und Silber-Scheideanstalt *BP* 802,035

Organic compounds containing one or more CN groups accelerate the release of oxygen from per-compounds. This enables textiles to be cleaned and bleached by a mixture of a per-compound and a nitrile at 50–80°c. to yield as good results as would be obtained by the use of the per-compound alone at 100°c. C.O.C.

Lithium Carbonate for Removing the Smell of Urine from Textiles

L. W. Melander *USP* 2,815,260

The soiled textiles are soaked for $\leq$ 1 min. in a cold solution of 5–48·5 g. Li_2CO_3 in 1 gal. water, then agitated for $\leq$ 20 sec. in the solution, squeezed, and finally rinsed for $\leq$ 30 sec. in clear water. C.O.C.

Bleaching Acrylonitrile Polymers

American Cyanamid Co. *BP* 801,237

The material in gel state is treated in successive baths, one of which contains aqueous chlorous acid or a chlorite (in either case $\leq$ 0·07% by wt.) and another aqueous oxalic acid ($\leq$ 0·02% by wt.). The baths are at 20–100°c. The polymer is rinsed between leaving one bath and entering the next one. C.O.C.

Chlorine Retention and Chlorine Damage of Resin-treated Fabrics (X p. 807)

Wet Soiling of Resin-treated Cotton Fabrics (X p. 808)

VIII—DYEING

Microscopic Studies with the High-temperature (Pressurised) Microdyeoscope

H. E. Millson

Amer. Dyestuff Rep., **47**, P 339–P 354 (19 May 1958)

The Microdyeoscope is a microscope with a cell built in so that objects can be observed under pressure and at high temperatures. The temperature range is 40–325°F. The results of experiments show that the dyeing rates of synthetic fibres can be appreciably increased by dyeing above 212°F. The degradation of wool, dyed chlorinated wool, rabbit hair, cotton, dyed viscose rayon, Orlon 42, and dynel by dyebath components at elevated temperatures is described with photomicrographs. P.T.S.

Classification of Isotherm Types for Adsorption from Solution

C. H. Giles and T. H. MacEwan

Proc. 2nd Internat. Congress Surface Activity, **3**, 457–461 and 524–526 (1957)

Adsorption isotherms from dilute solutions are classified into four main types— (i) L (Langmuir) type, where the initial portion is concave to the solution–concentration axis. This is the most common and usually represents a high-affinity solute. (ii) S type, where the initial portion is convex to the solution–concentration axis. It represents high affinity of the solvent and low affinity of the solute for the substrate, or in some cases, non-symmetry in the solute molecule. (iii) Ln (linear) type, where the initial portion is linear, occurs when the solvent has low swelling power for the substrate. (iv) H-A (high-affinity) type, where the initial portion is coincident with the substrate–concentration axis, occurs only in rare cases, where the solute has very high and the solvent has very low affinity for the substrate. W.K.R.

Affinity, Heat of Dyeing, and Entropy Change of Some Red Cotton Dyes

T. Uruhata

Kôgyô Kagaku Zasshi, **59**, 1171–1176 (1956): *Chem. Abs.*, **52**, 13266 (10 Aug. 1958)

The sorption of Congo Red (C.I. Direct Red 28), Benzopurpurine 4B (C.I. Direct Red 2), Benzopurpurine 10B (C.I. Direct Red 7), Fast Red DGL, Fast Red F (C.I. Direct Red 1), Orange R, Orange GG, Rhoduline Red B, Rose BD, Sirius Red 2B, Sirius Red 4B (C.I. Direct Red 81) and Sirius Pink 2B (C.I. Direct Red 75) was determined at 70, 80 and 90°c. The affinity, heat of dyeing and entropy changes were calculated using Vickerstaff's formulae (Vickerstaff, *Physical Chemistry of Dyeing* (1954)). The values obtained are given in tables and discussed with reference to the chemical constitutions of the dyes. C.O.C.

Absorption Spectra and Substantivity to Cotton of Congo Red (C.I. Direct Red 28) and Related Structures

F. H. Holmes

Trans. Faraday Soc., **54**, 1166–1171 (Aug. 1958)

The effects of substitution in the 3:3′ and 2:2′ positions in the diphenyl nucleus have been examined. 2:2′-Substitution weakens molecular conjugation. The equilibrium dyeing of cotton at 90°c. has been examined, and it is confirmed that 2:2′-substituted derivatives of Congo Red are much less substantive to cellulose than Congo Red and the 3:3′-substituted derivatives. Spectra and substantivity are consistent with the view that 2:2′-substitution induces non-coplanarity of the two halves of the diphenyl nucleus. W.R.M.

Dyeing of Rayon Staple

E. Elöd

Melliand Textilber., **39**, 892–900 (Aug. 1958)

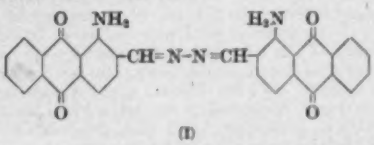
Different rayon samples (21) illustrated by cross-sectional photomicrographs, are acetylated in toluene for different times. Dissolution of the triacetate layers formed yields information on diffusion rates. Area and weight increases in water and uptake of selected direct, solubilised vat ester, and reactive dyes are tabulated extensively and compared with results for cotton and cuprammonium rayon. Appreciable differences are found in rates of diffusion and dyeing between samples as well as dyes, least with the rapidly diffusing reactive dye. Quantitative generalisations cannot be made. S.M.J.

Absorption of Chrysophenine G (C.I. Direct Yellow 12) by Cotton
F. H. Holmes
Trans. Faraday Soc., **54**, 1172–1177 (Aug. 1958)

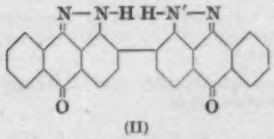
Studies of the equilibrium absorption of Chrysophenine G by cotton do not agree with the predictions of a current theory of the direct dyeing of cellulose. The substantivity ratio appears to increase indefinitely with increase of salt/dye ratio while theory predicts it should approach a finite limit. Contrary to theory, the relation between the substantivity ratio and the salt/dye ratio depends on the salt concentration. "Internal" absorption isotherms approximate to the Freundlich type, not the linear form assumed in formulation of the theory, and depend on the salt concentration. The failure of the theory may be caused principally by the unavoidable use of concentrations in place of activities. W.R.M.

Multiple Colour Changes during Redox Changes in Vat Dyes
W. Ried, A. Schaeffer, and W. Hensel
Melliand Textilber., **39**, 780–784 (July 1958)

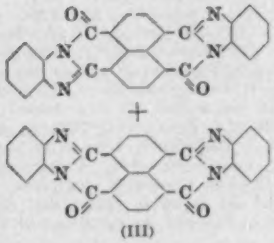
Redox potentials under nitrogen of I, II, III, and 19 derivatives are investigated—



(I)



(II)



(III)

The vat of I on oxidation passes through two intermediate colours and two intermediate levels in the redox potential curve, whilst derivatives with one α-amino group show only one intermediate level and colour. The infrared spectra of these and of I show evidence of hydrogen-bonding, unlike derivatives entirely devoid of α-amino groups. The latter also have no intermediate colour. Multiple colour change in I is regarded as due to stepwise formation or disruption of intramolecular hydrogen bonds. The two intermediate colours of II, attributed to proton and double-bond interchange between the N atoms, are reduced to one such colour in *NN'*-disubstituted derivatives. The two intermediate levels in the redox potential curve of III and the associated colours arise from two isomers, each individually showing only one such stage. The behaviour of some derivatives of III which are colourless when oxidised is described. S.M.J.

Effect of Thickeners in Padding with Ultradisperse Vat Dyes
R. Kern
Textil-Praxis, **13**, 589–595 (June 1958): *Teinture et Apprêts*, (44), 29–36) (Feb. 1958)

Migration often takes place during the intermediate drying of pigmented cotton. Addition of thickening agents to the padding liquor diminishes the tendency of colour to migrate. A number of thickeners were examined and results of their effectiveness are given. Reference is also made to padding with direct and disperse dyes. L.A.T.

Application of Solubilised Sulphur Dyes
J. Müller
Textil-Praxis, **13**, 613–616 (June), 731–735 (July 1958)

After a historical survey of the development of sulphur dyes, the author describes the application of solubilised sulphur dyes by both batch and continuous methods on the cellulosic, polyamide, and polyester fibres. L.A.T.

Dyeing of Flax and Hemp Yarn Cheeses
E. Wilhelm
Textil-Praxis, **13**, 586–588 (June 1958)

The dyeing of linen and hemp yarn in package form with vat dyes still presents some difficulties. The author describes how these were overcome by applying the dye in pigment form in a machine specially adapted for this purpose from a commercial centrifuge with a hollow shaft for the delivery of the dispersed pigment. L.A.T.

Application and Action of Solidegal GL in Dyeing with Indanthren Dyes
E. Scheel and H. Musshoff
Melliand Textilber., **39**, 643–652 (June 1958)

Levelness in vat dyeing depends on rate of strike, aggregation tendency, and migration characteristics of the dye. The relationships between aggregation, molecular size, dye concentration, and solubility, temperature, vat stability, rubbing fastness, and substantivity are summarised. Promotion of levelling by the use of solvents, e.g. 10% pyridine, is uneconomical. Retarding agents based on ethylene oxide condensation products of ethylated phenols, useful for pale dyeings, have affinity for the dyes and lower final exhaustion. This is not the case when 0·2–1·0% solutions of the non-ionic Solidegal GL are employed. Practical processes discussed in detail include— pigmentation with subsequent reduction and fixation; stepwise raising of temperature; combined vat acid–temperature step process; jig and winch dyeing; pad–jig process using pigment and vat acid; continuous processes such as pad–steam and Standfast molten metal. S.M.J.

Relation between the Adsorption Properties of Dyes and their Photochemical Behaviour
C. H. Giles
Proc. 2nd Internat. Congress Surface Activity, **1**, 92–101 and 140 (1957)

Spectroscopic measurements show that Methylene Blue (C.I. Basic Blue 9) is present as a mixture of monomer and aggregate in transparent films of gelatin or methylethylcellulose. The monomeric material fades more rapidly than the aggregate. The proportion of monomer and the rate of fading are increased by the addition of urea, a disaggregating agent. It is shown that this relationship between physical form and rate of fading also occurs with various sulphonated azo dyes. Comparison of the surface activity of dyes in monolayers on water or inorganic salt solutions with the rate of fading in gelatin or methylethylcellulose films shows that (*a*) dyes which readily form condensed monolayers on water fade more rapidly in films, probably due to lower aggregate formation, (*b*) a cationic agent promotes the formation of condensed monolayers on water and increases the rate of fading in films, (*c*) dyes which are very similar in chemical and light absorption properties may differ appreciably in fading rates because of differences in their physical form in the substrate. W.K.R.

Phototendering by Anthraquinone-2:6-disulphonic Acid of Cotton Duck before and after Weathering
A. D. Baskin and A. M. Kaplan
Text. Research J., **28**, 554–559 (July 1958)

Treated fabrics appeared to deteriorate at rates directly related to the light intensities at three widely different sites. They also showed a statistically significant loss in breaking strength prior to weathering. In strong light, rapid rates of loss were obtained to which linear functions applied, but in reduced light the data were best fitted by quadratic functions. The former appears consistent with phototendering while the latter conditions prevail when deterioration results mainly from microbiological activity. S.B.D.

Reactive Dyes on Textiles
T. Vickerstaff
Melliand Textilber., **39**, 765–771 (July 1958)

Principles of Dyeing with Reactive Dyes
T. Vickerstaff
Melliand Textilber., **39**, 905–914 (Aug. 1958)

Reactive Dyes for Cellulose and Practical Experience in their Application
F. Schlaeppi
Amer. Dyestuff Rep., **47**, P 377–P 383 (2 June 1958)

Remazol (FH) Reactive Dyes in a Dyehouse
H.-U. von der Eltz
Textil-Praxis, **13**, 584–586 (June 1958)

Remazol dyes are a new class of reactive dyes for cotton and regenerated cellulosic fibres. Methods of application under works conditions are described. L.A.T.

Pigment Dyeing of Fabrics with Imperon (FH) Dyes
G. Weckler
Melliand Textilber., **39**, 652–658 (June 1958)

Pigments are nonsubstantive. Binders must resist alkali, solvents, heat, and light, and be efficient, to avoid unduly harsh handle. The advantages of pigment dyeing are summarised. Cost and rubbing fastness make deep colours impracticable. The 18 Imperon dyes and auxiliaries (oil-in-water emulsion) are stable and can be fixed by steam or dry heat. Application on the padding mangle is described, followed by hot flue or stenter drying. A selection of the range is dischargeable with formaldehyde-sulphoxylate before fixation. Fastness properties on cotton and polyester fibre are tabulated. Light fastness is often 7–8, wet rubbing fastness 2–3. They can be applied to cellulose, cellulose acetates, polyamides, polyacrylics, and polyesters, and are especially useful for blends. S.M.J.

Influence of Dye Structure on Rate of Wool Dyeing
J. H. Skinkle and E. W. Makuch
Amer. Dyestuff Rep., **46**, P 578–P 582 (12 Aug. 1957)

The equilibrium exhaustions and times of half-dyeing $t_{\frac{1}{2}}$ of 5 univalent acid dyes were measured at 60°c. on wool presaturated with 1·00 g-equiv. of HCl per kg. Dyebath exhaustion was estimated spectrophotometrically. Affinity was expressed as log [(dye on fibre)/(dye in sol.)]. Comparison of C.I. 58005 with C.I. 14270, of similar size, shows that the affinity of the former is 11% greater, and log $t_{\frac{1}{2}}$ 4% greater. Increasing the size of an azo dye by a benzene nucleus in the hydrophilic portion (cf. C.I. 15620 with C.I. 15970) raises the affinity by 10% but decreases log $t_{\frac{1}{2}}$ by 16%; but introducing a benzene nucleus into the hydrophobic portion raises the affinity by 11%, while log $t_{\frac{1}{2}}$ falls only by 6% (cf. C.I. 15620 with C.I. 15970). Comparison of 2 azo dyes of identical carbon skeleton but with sulpho groups in different positions shows a change in affinity of only 1%, while log $t_{\frac{1}{2}}$ changes by 11%. Affinity and log $t_{\frac{1}{2}}$ both increase with the number of benzene nuclei present, the anthraquinone linkage (C.I. 58005) corresponding to an extra benzene nucleus. L.P.

Effect of Dye and Acid Valencies in Wool Dyeing
J. H. Skinkle
Amer. Dyestuff Rep., **47**, 291–296 (5 May 1958)

In the study of rates of dyeing, classical diffusion theory must be modified by taking into account ionisation within the fibre and ionisation of the dye molecules. Experimental results are interpreted as showing that in the acid dyeing of wool, acid diffusion rates as well as dye diffusion rates eventually affect the rate of dyeing. A theoretical rate equation—

$$\frac{t}{t_{\frac{1}{2}}} = \left(\frac{a}{0{\cdot}5}\right)^n$$

is shown to fit experimental data for the first half of the dyeing; and—

$$\frac{t}{t_{\frac{1}{2}}} - 1 = \ln\left(\frac{0{\cdot}5}{1-a}\right)^k$$

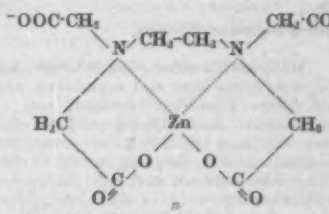
fits experimental data for the second half of the dyeing (t = time of dyeing; $t_{\frac{1}{2}}$ = time when dye uptake equals half the equilibrium dye uptake; a = relative dye exhaustion; and n and k are constants which depend on the valency of the acid anion). The valency of the dye anion is shown to have a smaller effect. P.T.S.

Interaction of Orange II (C.I. Acid Orange 7) with Monolayers of a Keratin Derivative
B. S. Harrap
Proc. 2nd Internat. Congress Surface Activity, **4**, 295–301 and 349–350 (1957)

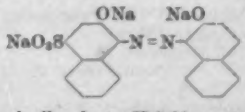
The interaction of Orange II with monolayers of a wool keratin derivative, *S*-carboxymethylkeratein-2, has been studied as a function of pH and ionic strength. At low ionic strengths, interaction only occurs by ionic binding of the dye anions by positively charged protein side chains, but at higher ionic strengths the dye anions penetrate the monolayer, causing further interaction. For maximum interaction the pH and ionic strength conditions must be such that the dye is able to approach the monolayer and also to form a relatively stable adsorbed film at the air–water interface. W.K.R.

Afterchroming of Acid Chrome Dyes on Wool
K. Muszkat
Przemysł Włókienniczy, **11**, 504–507 (Oct.); 605–608 (Dec. 1957)

The addition of Trilon B to the alkaline soln. of the Zn complex of the oo′-dihydroxyazo afterchrome dye (C.I. 15705) changes its colour from bordeaux to blue. This is due to the formation of the colourless Trilon B–Zn complex—



thus liberating the blue dye—



The dye soln., buffered at pH 9·21, containing *n*-butanol and a small quantity of ammoniacal $ZnSO_4{,}7H_2O$, is stable and suitable for photometric analysis. Paper chromatography supplies a means for determining the Cr complex and uncomplexed dye present on the fibre. The dye is extracted from 1–2 g. of wool, dyed with 4% dye, with a solvent composed of 20 ml. H_2O, 5 ml. *n*-butanol, and 1 ml. aq. soln. of 17 mg. NH_3 and 18 mg. $ZnSO_4{,}7H_2O$. The extract is evaporated to dryness and dissolved in aq. *n*-butanol buffered at pH 9·21. This soln. is transferred on to Whatman's No. 3 chromatographic paper and developed for 2–3 hr. at 20°c. in the atmosphere of the solvent. The upper part of the paper contains the Cr complex in the form of a deep blue sharply defined line. The unchromed dye collects at the bottom of the paper in two pink lines, and after elution can be estimated photometrically.

The total amount of dye on the material can be estimated by warming a dyed sample in *N*-NaOH to 90°c., thus hydrolysing keratin to amino acids. The soln. so obtained is acidified with oxalic acid. The dye is salted out, filtered, washed with sat. NaCl, and after boiling for 30 min. in 50% oxalic acid, which causes formation of Cr complex with the latter, is extracted with *n*-butanol and estimated photometrically. The loss of dye due to oxidation with $K_2Cr_2O_7$ used in dyeing, which is of the order of 30–45%, commences at the beginning of the process. The pH value of the dyebath should be 4–5; at lower values the oxidation loss is higher. The minimum value of $K_2Cr_2O_7$ is 15% on wt. of dye used. It is possible to eliminate the loss of the dye in the dyebath due to oxidation by the use of a reducing agent in mordanting, such as $Na_2S_2O_3$, which quickly reduces Cr^{6+} to Cr^{3+}, which is followed by normal dyeing. The length of the whole operation is similar to normal afterchrome dyeing time. This method of wool dyeing with acid chrome dyes was successfully employed industrially and is described in *Polish Patent* 40420 (1957). T.Z.W.

Adsorption Method in Wool Dyeing
V. V. Brazauskas and V. V. Klusis
Tekstil. prom., **18**, 37–40 (March 1958)
Chlorides of Ba, Ca, or Mg, or $MgSO_4$ (Mg salts being the most effective) are used to obtain suspensions of acid and chrome dyes, which are then adsorbed by wool at the boil. The authors claim that this method is superior to the conventional one—the time required for dyeing yarns and fabrics is reduced by a factor of 1·5–2 and 3–3·5 respectively; the loss in fibre strength is reduced from 11–15% to 6–7%. Breaking during spinning is reduced by 45% and during weaving by 70%. The fastness of the dyed material to water, milling, carbonisation, and rubbing is not adversely affected by the new method. G.J.K.

Dyeing Wool–Polyester Blends. III—Thermal Stability of Polyester Disperse Dyes on Wool
A. Würz
Melliand Textilber., **39**, 775–779 (July 1958)
The one-bath method of dyeing leaves some Palanil (BASF) polyester dyes on wool. Fastness properties of 31 of these dyes on wool to contact heat, steam-pleating, and decatising are tabulated. Dry heat stability greatly exceeds that of the same dyes on polyester fibres, though it is lowered in depths greater than those likely to be found in practice. Fastness to steam treatments is somewhat lower. S.M.J.

Dyeing Wool–Polyester Blends
H. Collé
Melliand Textilber., **39**, 885–888 (Aug. 1958)
Dyeing polyester fibres loose and as slubbing, and blends in yarn and fabric form by one-bath and two-bath methods, is discussed. Azoic dyeing using Intramin (FH) naphthol–base mixtures at 100°c. or over with subsequent diazotisation and coupling at up to 80°c., and disperse dyeing with carriers and high temperatures are described. Metal-complex (2:1) dyes are preferred for wool. Recipes for reducing and oxidising clearing treatments are given. S.M.J.

Practical Problems in the Processing of Textiles made from Polyester Fibres
H. Stern and H. U. Schmidlin
Textil-Praxis, **13**, 617–622 (June), 726–731 (July 1958)
The authors give an account of the experience so far gained in the laboratory and in industrial practice in the preparatory treatments, dyeing, and finishing of textiles made of polyester fibres and their unions with natural fibres. L.A.T.

High-temperature Dyeing of Polyester Fibres
J. Barak
Tekstil. prom., **18**, 61–63 (June 1958)
The effect of high-temp. dyeing (120°c., 2·5–3 atm.) on Terylene yarn, using disperse dyes (pH 4·5–4·8), is investigated, and the following dyeing times are quoted; 30 min. for the Setacyl Violet 4RT Supra group of dyes; 20–30 min. for Setacyl Pink JB Supra; 40–50 min. for Setacyl Orange G Supra. G.J.K.

Rôle of Surface-active Agents in the Dyeing of Synthetic Fibres
K. Saito, Y. Nemoto, and T. Imai
Nagoyashi Kógyó Kenkyûjo Kenkyû Hókoku, **18**, 1–15 (1958): *Chem. Abs.*, **52**, 13268 (10 Aug. 1958)
Trials made on dyeing polyester fibres with Dispersol Fast Scarlet B 150 (C.I. Disperse Red 1) in presence of a carrier and a surface active agent. Preferred combinations are (carrier, surface active agent and its concentration)—*o*-phenylphenol, Na dodecylsulphate, 0·5 g./l.; biphenyl, Na diethylsulphosuccinate, 0·5 g./l.; methylsalicylate, Na, dodecylbenzenesulphonate, 0·75 g./l. The activation energy of dyeing was using *o*-phenylphenol —32 kcal., using biphenyl —35 kcal. and methyl salicylate —46 kcal. These values were unrelated to the surface active agent used. Azoic dyeing of polyester fibre using 2-amino-4-nitrotoluene as the azoic diazo component was tested with various surface active agents, deca(oxyethylene)dodecyl ether gave the best results as regards affinity and fastness to sunlight. Deca(oxyethylene)dodecyl ether also gave the best results in the dyeing of polyacrylonitrile fibre with acid dyes. These results have been confirmed by works trials. C.O.C.

Dyeing of Wool–Dralon Unions
G. Thiel
Textil-Praxis, **13**, 600–605 (June 1958)
Production of solid colours, two-tone, and reserve effects on Dralon acrylic fibre blended with wool is described. Practical recipes are given in the text. L.A.T.

Dyeing of Courtelle for the Woollen and Worsted Trade
Courtaulds Ltd.
Dyer, **120**, 25–29 (4 July 1958)

Dyeing of Helanca
H. von Beckerath
Z. ges. Textilind., **60**, 239–240 (25 March 1958)
The antistatic spinning preparation on the fibre is removed by raising slowly to the boil in a bath containing Castile soap, soda, and an emulsifying agent, and boiling for 1·5–2 hr. As Helanca is a polyamide fibre, the most suitable classes of dyes are special acid, disperse and metal-complex dyes. Typical examples of these types are given. In dyeing Helanca–wool blends with acid dyes, a retaining agent of the sulphonated oil type is recommended. Good tone-in-tone effects can be obtained with metal-complex dyes. Helanca–cellulose acetate blends can be dyed with disperse dyes, but for articles such as bathing costumes azoic dyes are to be preferred despite levelling difficulties. Bleaching of Helanca is best done with sodium chlorite, and can be followed by the application of optical bleaching agents. A brief summary of the types of machinery most suitable for the various forms of the fibre is given. J.C.F.

Efficiency of Orlon Dye-retarding Agents in relation to Chemical Structure
S. Cohen and A. S. Endler
Amer. Dyestuff Rep., **47**, 325–328 (19 May 1958)
Compounds investigated: 4 long-chain primary amines, 8 long-chain quaternary ammonium compounds, and 3 other long-chain amine derivatives. The results show that any long-chain amino compound can be used as a levelling agent. Preference for quaternary ammonium compounds may be justified by their stability at high pH values and their resistance to discoloration, etc. Optimum chain length for alkyltrimethylammonium salts is about C_{12}, which will give a steady dyeing rate to fairly high degrees of exhaustion. In practice, C_{14} or C_{16} may be better because there is an induction period before dyeing takes place, and this prevents uneven initial strike although a high degree of exhaustion is reached more quickly than with C_{12}. Only one dye was used in the experiments, but different dyes are unlikely to change the *order* of effectiveness of levelling agents. References to the theory of the action of levelling agents. P.T.S.

Dyeing Glacé Kid Black
A. Simoncini
Cuoio, Pelli, Mat. conciarti, **33**, 5616–5631 (1957): *Chem. Abs.*, **52**, 11452 (10 July 1958)
On chrome-tanned kid skins maximum fastness to rubbing was given by Hematine (C.I. Natural Black 1) using $FeSO_4$ as mordant and $K_2Cr_2O_7$ as oxidising agent or by diazo blacks. Acid blacks give the least fastness to washing and vat blacks the greatest. The only drawback to the use of Hematine is that leather dyed with it has lost in strength. C.O.C.

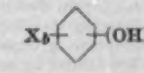
PATENTS

Increasing the Affinity of Cellulosic Fibres for Basic Dyes and Dyes containing *iso*Thiouronium or Quaternary Ammonium Groups
ICI *BP* 800,735
The fibres are impregnated with a mixture of polyacrylic acid and an alkali metal or NH polyacrylate and then dyed. The process is particularly applicable to cotton and cuprammonium rayon. C.O.C.

Dyeing Polyester Fibres with Phthaloperinones and Naphthaloperinones
S *BP* 800,200
Polyester fibres are dyed orange and reds of good fastness to light, gas fume fading, sublimation and washing, by aqueous dispersions of low molecular weight phthaloperinones and naphthaloperinones, e.g. with 12:13-dichloro-, 11:12:13:14:15:16-hexahydro or 11:14:15:16-tetrahydrophthaloperinone. C.O.C.

Assistant for the Dyeing of Acrylonitrile Fibres
Deering Milliken Research Corpn. *USP* 2,812,230

A mixture of a dimer of furfuryl alcohol and a compound of formula—



(X = H, hydrocarbon, hydroxyphenylalkyl, carboxy or Hal; $a = 1$–3; $b = 1$–2; $a + b < 4$), e.g. *p*-phenylphenol, is an excellent assistant (carrier) when dyeing acrylonitrile fibres with acid and disperse dyes. C.O.C.

Dyeing Acrylic Fibres with Acid Dyes in presence of a Cupric Salt and a Naphthol Compound
Deering Milliken Research Corpn. *USP* 2,812,998

Acrylic fibres are readily dyed with acid dyes in presence of a cupric salt and a naphthol compound. Thus Orlon 81 acrylic filament was dyed in 20 min. in a boiling bath containing C.I. Acid Orange 8, $CuSO_4$, and *β*-naphthol. The naphthol has the ability to cause absorption of Cu on to acrylic fibres from baths containing copper only in the cupric state. C.O.C.

Affinity of Immedial Indone RR (C.I. Sulphur Blue 7) for Cotton (IV p. 789)

Blue Disperse Dyes for Aromatic Polyesters (IV p. 793)

Colorimetric Determination of C.I. Azoic Coupling Component 2 and Affinity of C.I. Coupling Component 2 for Cotton (XIV p. 811)

IX— PRINTING

Printing and Printing Pastes
K. Schmidt

Textil-Praxis, **13**, 609–613 (June); 716–720 (July 1958)

Methods of measuring the viscosity and flexibility of printing pastes are described. The effect of various thickening agents on the quality of print is discussed. Instead of subjective appraisal of variables in printing, the author endeavours to substitute methods of objective assessment. L.A.T.

Diazonium Processes
K. M. Hornsby

Brit. J. Phot., **105**, 8–9, 13 (1958)

Colour Development: Specifications. *Ibid.*, 106–107, 110, 113— Sensitising Dyes, Chemical Sensitisers, Antihalation Dyes, Diffusion-Transfer Process, Film Base Materials, Photomechanical Printing Plates. *Ibid.*, 120–122, 128— Sensitising Dyes and Antihalation Systems. *Ibid.*, 174–175, 186–187— Azo Dye Images, Colour Coupler Incorporation, Electro-optical Colour Correction, Colour Photographic Equipment. *Ibid.*, 220–222— Miscellaneous (Copying and Transfer Processes), Black Diazo Images. *Ibid.*, 247–149— Photoreduction of Dye Derivatives, Sensitising Dyes, X-ray and *γ*-ray Emulsions, Emulsion Making. *Ibid.*, 274–275— Continuous Emulsion Preparation, Gelatin Hardeners, Synthetic Colloid Materials, Coating Acids, Enhanced Clayden Effect, Mouldable Films. *Ibid.*, 292–293, 298; *Chem. Abs.*, **52**, 12630 (10 Aug. 1958). Reviews of patents. C.O.C.

Neutrogene Azoic Dyes in Printing
D. Marian

Amer. Dyestuff Rep., **47**, P 384–P 388 (2 June 1958)

After a historical introduction, the advantages of Neutrogenes (Fran) (neutral-ageing azoic dyes) in printing are discussed. In brightness, uniformity, and vividness they are comparable with or surpass the insoluble azo Rapidogens. They are not very sensitive to reducing agents and so can be printed alongside vat dyes. The effect of any caustic soda in the printing paste is far smaller than with other azo dyes. Doctor streaks are absent in roller printing with Neutrogenes. Their levelling properties are satisfactory. They do not bleed on to white grounds. There is a consideration of the economic aspects involved in Neutrogene printing. P.T.S.

Printing of Cotton with Vat Dyes
N. A. Oskorbina and F. I. Sadov

Tekstil. prom., **18**, 27–29 (June 1958)

The quantitative transfer of vat dyes on to cotton fabric can be speeded up by passing saturated live steam continuously into the ager, or by steaming the humidified fabric immediately prior to its entry into the ager. Printing with leuco compounds of the dye is not recommended as improved brightness, caused by surface attachment of the dye, yields decreased fastness to wet treatment. A similar phenomenon occurs when starch is used as thickening agent. When printing with coarsely dispersed pastes or powders which require preliminary reduction no thickening agents with affinity for the leuco compounds of the dye should be employed. G.J.K.

Optimum Conditions for Printing Viscose Rayon Staple Fabric with Variamine Blue B (C.I. Azoic Diazo Component 35)
F. I. Sadov and N. N. Voznezenskiĭ

Textil-Praxis, **13**, 597–600 (June 1958)

See *J.S.D.C.*, **74**, 499 (June 1958).

Printing of Indigosols on Triacetate
P. Diserens

Teintex, **23**, 553–558 (Aug. 1958): *Dyer*, **119**, 787, 789, and 791 (23 May 1958)

A number of carriers were examined, and halogenated alkylphenols found to satisfy most of the desiderata. Fixer TRA (DH) is of this type. S.R.C.

Printing Trevira Polyester Fibre
K. Roth

Melliand Textilber., **39**, 665–669 (June 1958)

Dry heat fixation for 30 sec. at 200°C. of polyester fibre provides form stability. Light embossing of the reverse at a higher temperature and partial surface hydrolysis by boiling in alkali produces a softer handle. The Samaron (FH) range of 40 disperse dyes, preferably printed with an alginate thickening, can be fixed by steaming for 10–15 min. under 1–2 atm. pressure discontinuously, or by dry heat, when yields tend to be lower unless a carrier (Remol TRD) is used, which lowers light fastness. Rubbing fastness is improved by an alkaline reduction-clearing treatment. Fastness to heat-setting often decreases with increasing depth. The printing of Imperon pigments, of some vat dyes as pigments, and of leuco esters (Anthrasols), which often give low yields on heat-setting, is also discussed briefly. S.M.J.

Protecting Colour Photographs from Fading
Y. Tomoda and M. Kawasaki

Tokyo Kôgyô Shikensho Hôkoku, **52**, 3647 (1957)

Colour photographs exposed in a Fade-Ometer for 6 hr. to yellow and magenta and 12 hr. to cyan and are light were less fast when coated with quercetin (0·075 mixed with 0·35 g. of cellulose, 9·0 g. of NH_4 acetate and 21·0 c.c. acetone) than when immersed in 1–3% aq. pyrocatechol and dried, i.e. ultraviolet absorbers offer less protection than antioxidants. C.O.C.

PATENTS

Printing or Decoration of Ceramics, Plastics, Glass, etc.
Murray Curvex Printing *BP* 801,262

Modification of *BP* 735,637 (*J.S.D.C.*, **71**, 689 (1955)). The design is formed in relief on an etched plate. Ink or paint is applied to the plate and excess removed by a doctor from the raised portions, and at the same time pressed into the lower (background) portions. A resilient pad is then pressed against the plate to extract the colour from it and is then pressed against the article to be decorated to print the background on it and leave the design free from colour. C.O.C.

Application of Ceramic Colours by Squeegee or Screen Printing
DuP *BP* 801,697

At least one coating or print of a ceramic colour composition which is fluid and non-volatile at 120–230°F. but solid at < 120°F. is applied while at 120–230°F. to a surface which is at < 120°F. so that it solidifies immediately it is applied. This is followed by application of a fluid ceramic colour composition containing a volatile solvent. The solvent is dried off and the surface fired to fuse the colours to it. C.O.C.

Printing on Polyethylene
American Cyanamid Co. *USP* 2,811,106
Polyethylene can be printed on with rubber type or the like and the prints made fast by heating the printed surface to 74–95°c. for $\leqslant$ 10 sec. and then chilling the surface to $<$ − 30°c. for $\leqslant$ 15 sec. C.O.C.

Improving the Printability of Polythene
ICI *BP* 800,714
Much improved adhesion of printing inks to polythene is obtained if it is first treated with ozone at $\leqslant$ 50°c. C.O.C.

Printed or Lacquered Aluminium Foils
Aluminium-Walzwerke Singen *BP* 800,479
An etch primer for aluminium foil contains as active constituents a vinyl resin, phosphoric acid, and chromic acid in an organic solvent, and 0·1–5·0% by wt. of an aliphatic or aromatic hydroxy acid or ester, e.g. anhydrous chromic acid (0·45 g.), water (1·0), 85% phosphoric acid (1·1), poly(vinyl butyral) (11·0), methylethylketone (10·45), ethyl alcohol (60·0), butanol (15·0) and citric acid (1·0). C.O.C.

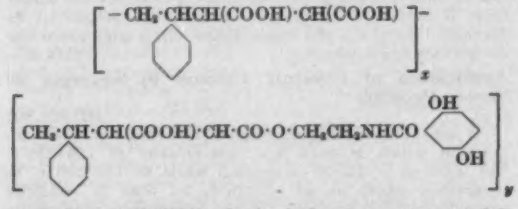
Transfers for Use on Cloth
G. J. L. Wooldrik *USP* 2,810,673
The design is printed with a fatty printing ink on to paper and then transferred to cloth treated with a synthetic resin, the amount of resin used being insufficient to fill the meshes of the cloth. C.O.C.

Transfer Sheet
Columbia Ribbon & Carbon Mfg. Co. *USP* 2,810,661
A non-smudging transfer sheet capable of both transferring an image and producing a negative is made by using a coating made up of a colour-bearing material on a cellulose heat-resistant base instead of the usual wax base. The cellulose base is modified with a plasticiser which renders it adherent to a smooth non-porous backing and yet more adherent to a copy sheet. C.O.C.

Laterally Non-reversed Positive Copies by Heat Development
Agfa *BP* 801,053
An exposed silver halide emulsion layer is brought into contact with a transfer layer containing a compound which splits off S at 80–150°c., heating the assembly and then separating the two layers. Thus a negative layer consists of a silver halide emulsion to which has been added 4-aminophenol hydrochloride and sodium acetate. The transfer layer consists of Na_2S in polyvinyl alcohol. After the negative layer has been exposed, it is placed against the transfer layer and heated for 10–60 sec. at 135–165°c. This results in formation of a reddish-brown positive image in the transfer layer. C.O.C.

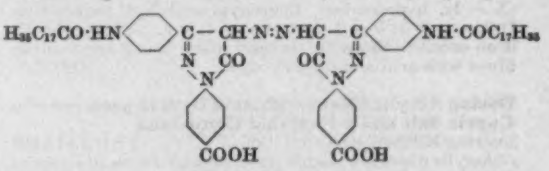
Multicolour Photography
Dyco Color Corpn. *USP* 2,814,565
A method of controlling the emulsion sensitivity characteristic in an emulsion on formation of a first colour in it. C.O.C.

Polymeric Gentisamide Antistain Agents for Colour Photography
Eastman Kodak Co. *USP* 2,816,028
The products obtained by treating a styrene–maleic anhydride condensate (preparation described in *USP* 2,698,794) with a derivative of gentisamide, e.g. the compound—



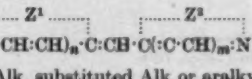
(x and y = 50–2000) obtained from a styrene–maleic anhydride condensate and *N*-β-hydroxyethylgentisamide, are excellent antistain agents for addition to colour photographic emulsions. C.O.C.

Masked Colour Photographic Images
Agfa *BP* 800,262
Masked photographic colour images are produced by use of a coloured colour coupler whose exposed portions are converted into an azomethin dye by the development products of a colour forming developer. In the colour coupler the active methylene groups of two identical colour coupler radicals are linked by an azo group, e.g.



C.O.C.

Increasing the Photosensitive Properties of some Cyanine Dyes
Kodak *BP* 800,117
Eastman Kodak Co. *USP* 2,816,029
Dyes of formula—



(R^1 and R^2 = Alk, substituted Alk or aralkyl; m and n = 0 or 1; X = acid radical; Z^1 and Z^2 = atoms to complete a 5- or 6-membered ring), e.g. 1′:3-diethyl-6′-methoxy-5-phenylthia-2′-cyanine-*p*-toluenesulphonate, display infrared photosensitising power in presence of water-soluble Cd or Zn salts. C.O.C.

Printed and Embossed Rubber (XIII p. 810)

X—SIZING AND FINISHING

Arrhenius Equation in Accelerated Ageing Studies
F. H. Steiger
Amer. Dyestuff Rep., **47**, 287–290 (5 May 1958)
If k is some measure of the rate of a reaction and if numerical values for k can be found experimentally at different temperatures, then the graph of the logarithms of the numerical values of k plotted against the reciprocal of the temperature (absolute) is a straight line if the mechanism of the reaction does not change within the temperature range investigated. The relationship can be used to predict the results of experiments and to predict the behaviour of industrial processes at previously untried temperatures. In the present paper the applications of the Arrhenius equation to ageing processes (deterioration of rubber, the stability of a thermosetting resin during storage, etc.), to the yellowing of nylon, to the heat fastness of antistatic agents, to the bath stability of a catalysed thermosetting resin, and to the curing of finishes on fabrics, are all treated. P.T.S.

Prevention of Wool Fabric Shrinkage with Polyamide–Epoxide Resin Finishes
C. E. Pardo and R. A. O'Connell
Amer. Dyestuff Rep., **47**, P 333–P 338 (19 May 1958)
Wool fabric is shrinkproofed if the polyamide resin is applied and cured on the fabric before applying the epoxide resin, or if the two resins are mixed before application. If the epoxide is applied before the polyamide, or if the fabric is treated with either resin alone, then the resistance to shrinkage is only poor. If the mixture of resins is used, the proportion to give good shrinkproofing must be 30–70 parts by weight of either resin, and 3·5–4·0% resin must go on to the fabric. The stiffer the unwashed fabric after resin application, the more effective the shrinkproofing treatment, although after washing the fabric rigidity returns to practically the same value as untreated fabric even though the resistance to shrinking is maintained. The mechanism by which the treatment prevents shrinkage is not fully understood, but single fibres taken from treated fabric show no change in surface friction or elastic properties. An increase in force-to-break tension at various levels of twist in resin-treated single-ply yarns indicates that the treatment operates through interfibre resin bonding, at least in part. P.T.S.

Reactivity of Keratin
J. B. Speakman

J. Soc. Leather Trades' Chem., **42**, 135–148 (May 1958)

In the modification of the properties of wool to meet specific needs attention is now focused mainly on the reactions of cross-linking and polymerisation. Progress in the former is limited by a lack of precise knowledge of the differences in composition between the cryst. and amorphous (I) phases of keratin. It has been shown that considerable cross-linking is necessary if I is to be reinforced to a commercially useful extent. There are three general methods (these are discussed) by which I may be easily reinforced by preferential internal polymerisation of vinyl cpd., and even more successful is the use of monomers which combine with reactive side-chains in the keratin, producing graft copolymers. J.W.D.

Chlorination of Wool Cheeses
M. Vescia

Melliand Textilber., **39**, 914–916 (Aug. 1958)

Theories of felting shrinkage and oxidising anti-shrink treatments are listed. Comparative shrink-resist trials are carried out in the Thies package-dyeing machine equipped with a coaxial pump. Stockings are then knitted from the yarn, and the shrinkage is determined after 5 min. manual milling in soap solution. The wool is first scoured, then impregnated with varying amounts of Na_2SO_4, Na_2PO_4, and gelatin. Hypochlorite containing both 4 and 8% active Cl on the goods at pH 5 and 6 for 30 min. at 17°C. gives better results than at pH 8·5 (completely ineffective) or 3·5 (uneven) and than permanganate or persulphate, but the best results (no felting whatever) are obtained with NaClO equivalent to 1·8 g. active Cl per litre together with 1 g. $NaClO_3$ per litre for 40 min. at 15°C. and pH 5·5–6 with a liquor ratio of 15:1 after dyeing. S.M.J.

Deposition of Polyacrylonitrile in Wool. III—Preparation and Properties of Wool containing Polyacrylonitrile deposited with Persulphate Initiator Systems
B. K. Lohani, L. Valentine, and C. S. Whewell

J. Textile Inst., **49**, T 265–T 278 (June 1958)

20–25% Polyacrylonitrile can be deposited in wool using a dilute monomer solution and a persulphate initiator. The reaction is faster in a sealed tube or in nitrogen, but it can be carried out in air, and it is claimed by the authors that the method could easily be adapted for conventional dyeing and finishing machinery. The effects of different weights of polymer in the fibre on fibre properties are examined. Persulphates increase the supercontraction of wool in boiling 5% $NaHSO_3$, but deposited polymer almost restores the supercontraction to the value found with untreated fibres. Compared with untreated fibres or fibres treated with Fe^{3+}–H_2O_2 initiators, it is more difficult to impart a permanent set to a fibre treated with persulphates, stretched in cold water and immersed extended in boiling water. Persulphate treatment reduces the work necessary to stretch a fibre 30% of its length, but the strength is almost restored if 30% polyacrylonitrile is deposited within the fibre. At this concentration there is some loss in the power of recovery of the fibre. The iso-ionic point of wool determined by titration or pH measurement is 6·2; of wool treated with persulphate initiator 5·8, and of wool + 18·1% polymer 5·4. After surface polymer has been removed with dimethylformamide, up to 25% internal polymer has practically no effect on the directional frictional effect of the wool; spot welding between fibres does not occur; and with sufficient polymer, the ease of extension of the fibres returns to the value for untreated wool after it has been lowered by the persulphate initiator. Thus, the mechanism of the resistance of polyacrylonitrile-treated wool to milling shrinkage is not completely understood, and a further publication on the subject is promised. P.T.S.

Finishing of Pleated Knitted Fabrics
W. Ernst

Z. ges. Textilind., **60**, 336–340 (20 April 1958)

After dealing with mechanical aspects of pleating, the author discusses dyeing, bleaching, and finishing of the fabrics. A tabular analysis of possible faults in the finished product is presented. J.C.F.

Shrink-resist Finishing
F. Duhm

Melliand Textilber., **39**, 784–786 (July 1958)

Curves showing the residual shrinkage of cotton outerwear and shirts on repeated laundering are given for untreated, compressively shrunk, and crease-resist resin-treated cloths. Tensionless drying combined with resin treatment gives good results, enhanced washing fastness of dyeings, and easier dirt removal. Initial lowering of abrasion resistance becomes inappreciable in time. S.M.J.

Mechanical Properties of Cotton Fibres and their Response to Mercerisation
L. Rebenfeld

Text. Research J., **28**, 462–466 (June 1958)

Fifty fibres from twelve widely different cottons were mercerised at 0·1 g. tension, and the changes in fibre extensibility properties related to the degree of fibrillar orientation as estimated by the initial Young's modulus of elasticity. Although the fibre strength was increased, no relationship was found between the magnitude of this increase and the degree of orientation. Three of the cottons were also mercerised at tensions up to 1·0 g. The changes in fibre mechanical properties were found to be highly dependent on the tension exerted on the fibre during mercerisation. A tension of 0·1–0·2 g. appeared to be sufficient to overcome the tendency of cotton fibres to shrink during mercerisation. S.B.D.

Desirable Properties of Cellulosic Fabrics for Satisfactory Crease-resist Finishing
H. M. Ulrich

Textil-Praxis, **13**, 499–503 (May 1958)

The author describes prerequisite properties of fabrics which are to be resin-treated in order to obtain high-quality finish. Reference is made to the cloth construction, the cleanliness of the fabric, tensionless drying, fibre swelling, and uniform moisture content. Dyeing and raising (if required) are carried out before resin treatment. L.A.T.

Effect of Crease-resist Finish on Crease Recovery—II
W. Wegener

Melliand Textilber., **39**, 671–678 (June 1958)

The effect of time, direction of crease, and resin concentration on the crease recovery of a cuprammonium rayon filament taffeta is investigated by high-speed photography. An average resin concentration of 5% is used. The time dependence of crease recovery for up to 1 hr. can be expressed by— $\alpha^\circ = C^\circ\ (t + a)^n$, where C° represents the angle of crease recovery after 1 min., t the time in min., n characterises the rate of increase of crease recovery, and a is a "transformation constant". Maxima in crease recovery are found with creases in the direction of warp, weft, and at an inclination of 45°. Abrasion resistance falls as resin concentration rises. Viscose rayon, unlike cuprammonium rayon, requires higher resin concentrations for equivalent crease recovery, and at all concentrations has lower abrasion resistance. S.M.J.

Chlorine Retention and Chlorine Damage of Resin-treated Fabrics
A. C. Nuessle

Amer. Dyestuff Rep., **47**, 465–469 (14 July 1958)

The loss in tensile strength after ironing of chlorinated resin-treated rayon is due to retained chlorine from the bleaching bath. The extent of the damage does not depend only on the amount of chlorine taken up and the ironing temperature but is also greatly influenced by the nature of the resin. For instance, a melamine resin-treated fabric withstood an ironing temperature of over 350°F. before showing as much damage as that of a urea-resin-treated sample at 270°F. with an equivalent chlorine retention. The buffering power of the resin in neutralising liberated HCl is shown to be the cause. A comparison is made of the practical implications of this on the use of triazone resins or metal-salt catalysts. L.P.

Flame-resistant Finishing of Textiles with special reference to the Tetrakishydroxyphosphonium Chloride Method and other Methods based on Phosphorus
J. R. W. Perfect

Tinctoria, **55**, 121–126 (April 1958)

Wet Soiling of Resin-treated Cotton Fabrics

L. W. Mazzeno, R. M. H. Kullman, R. M. Reinhardt, H. B. Moore, and J. D. Reid

Amer. Dyestuff Rep., **47**, P 299–P 302 (5 May 1958)

Cotton cloth treated with cyclic dimethyl ethyleneurea–acrylate–silicone resin finish is prone to soiling during laundering, and the soiling is irreversible. Dirt particles become attached to the sticky resin finish. Cyclic dimethylethyleneurea resin does not, alone, cause wet soiling. The effect of time, temperature, and dirt concentration on wet soiling were investigated, and the experimental methods are described. Replacing soap by a synthetic detergent has little effect on the results. An electron micrograph is given of carbon particles attached to the surface of a cotton fibre treated with a resin prone to wet soiling. P.T.S.

Water Repellency and the Physiological Properties of Textiles

F. W. Behmann

Melliand Textilber., **39**, 786–790 (July 1958)

Structurally similar wool and Perlon U fabrics when dry have similar thermal conductivities; during moderate perspiration Perlon loses much more heat, with an undesirable peak after perspiration; in moist heat tolerance limits are attained more rapidly with Perlon owing to slower evaporation; in the cold, ice on wool forms like hoar frost, on Perlon in lumps, restricting mobility. Differences arise from capillary behaviour. Models show physiological desiderata to be hydrophilic for heat, hydrophobic for cold. The effect of water-repellent treatment is evaluated on the basis of capillary conductivity and resistance to diffusion of technologically similar wool, cotton, and Perlon U fabrics, calculated from the temperature and moisture distributions within numerous layers in two airtight experimental set-ups, subjected to temperature and humidity gradients respectively. Capillary conductivity passes through a maximum near saturation. The higher the moisture contents, the lower the conductivities at which resistance to diffusion becomes infinite. Wool is suitable for both heat and cold, its conductivity being negative at low and positive at high moisture contents, and its buffering capacity high. In the cold Perlon and cotton, with large positive conductivities, do not insulate well. In heat the conductivity of wool, lower than for cotton, is compensated by a larger buffering capacity, whereas the high conductivity of Perlon can compensate for its insufficient buffering capacity only in the absence of perspiration or other moisture. The advantages of wool are largely due to its poor wettability. Silicone impregnation renders the capillary conductivities of cotton and Perlon also negative for low moisture contents, but prevents macrocapillary moisture transport, limiting water-carrying capacity to the saturation of the fibres; this improves insulation in the cold and is beneficial for rainwear, but undesirable for other categories of clothing, in which even moderate perspiration accumulates as a continuous film between skin and fabric. S.M.J.

PATENTS

Flame-retardant, Weather-resistant Finish for Cellulosic Textiles

Courtaulds *BP* 800,157

The textile is treated with (*a*) Sb_2O_3 with or without another metallic oxide, (*b*) a chlorine-containing synthetic resin, and (*c*) an aminoplast. Thus a spun rayon fabric was impregnated with an aqueous paste containing Sb_2O_3, polyvinyl chloride, a urea–formaldehyde precondensate and NH_4 thiocyanate as catalyst for the latter, dried below 100°C. and baked at 150°C. for 2 min. This gave a rigidly stiff fabric which was resistant to flame and weathering. C.O.C.

Compressive Shrinking

Samcoe Holding Corpn. *BP* 800,049

Successive portions of the fabric are tossed forward and backward while being air dried, this treatment being best commenced when the moisture content has been reduced to $< 30\%$. The forward toss is always greater than the rearward toss. The rate of feed into the machine must be such that the fabric is completely relaxed throughout treatment and discharge from the machine. C.O.C.

Flame Resistant Finish

Victor Chemical Works *USP* 2,811,469

Excellent flame-resistance fast to washing is obtained by treating the cloth with a solution of a polymer of a dialkenyl monochloromethanephosphonate and then curing at moderate temperature. C.O.C.

Preventing Regenerated Cellulose from Yellowing in presence of Heat and Moisture

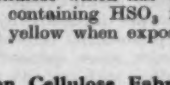
American Viscose Corpn. *BP* 800,199

Regenerated cellulose which has been treated in an aqueous solution containing HSO_3 ions and then dried does not tend to yellow when exposed to a hot, humid atmosphere. C.O.C.

Plissé Effects on Cellulose Fabric by use of 1:3-bis(Hydroxymethyl)-2-imidazolidone and a Chemical Shrinking Agent

Rohm & Haas Co. *USP* 2,810,624

The fabric is treated with 1:3-bis(hydroxymethyl)-2-imidazolidone



dried under tension and baked until cross-linking occurs. It is then treated with a shrinking agent, e.g. NaOH, applied in patterns. C.O.C.

Partial Acetylation of Cotton

U.S. Secretary of Agriculture *USP* 2,816,003

An improved and cheaper process of acetylating cotton to a degree of substitution of 0·5–2·0, consists in first soaking the fibres with an activating liquid consisting of acetic acid containing enough acetic anhydride to convert to acetic acid the regain moisture present in the fibres. The activated fibres are then treated with a mixture of acetic acid and acetic anhydride in presence of perchloric acid as catalyst. This mixture is obtained by recovering the acetylation mixture used for a previous batch of cotton and which is unsuitable for re-use and reconstituting as an acetylating liquid, with enough potassium acetate to neutralise 85–100% of the perchloric acid present, filtering off the precipitated potassium perchlorate and using the filtrate along with acetic acid and/or anhydride to reduce the proportion of perchloric acid in the liquids used to $> 0{\cdot}015\%$ by weight, to reconstitute and replenish the activating liquid. C.O.C.

Cyanoethylating Cellulose Textiles

Londat Aetz Fabric Co. *USP* 2,812,999

When treating cellulose textiles with NaOH and acrylonitrile a softer handle and more uniform appearance is obtained if a little of an alkyl nitrile, e.g. succinonitrile, is added to the acrylonitrile. C.O.C.

Preventing Wool Yellowing

U.S. Secretary of Agriculture *USP* 2,809,131

The tendency of wool to yellow with age is much reduced or eliminated by treating it with an ester of a phosphorus-containing acid, e.g. tributyl phosphate and dibutyl butane phosphonate. The effect is increased if the wool is acetylated before being treated with the ester. C.O.C.

Rendering Wool Fabrics Dimensionally Stable to Repeated Washing

Rohm & Haas Co. *BP* 801,987

The fabric is impregnated with an aqueous dispersion of a copolymer of 3·15% by weight of 4-vinyl pyridine with another monoethylenically unsaturated compound, e.g. an acrylic, methacrylic or itaconic ester of an alcohol containing Alk of 1–18 C, and is then heated at $< 100°$C. C.O.C.

Finishing Tubular Fabric

Samcoe Holding Corpn. *BP* 799,324

Continuous lengths of tubular knitted fabrics are extended or spread and steam is applied from transverse slats to the advancing fabric. An automatic control enables steam to be applied only to selected positions of the garment, e.g. steaming may be momentarily stopped as the ribbed waistband passes the steaming slat. G.E.K.

Rendering Nylon Filaments Bacteriostatic
Weco Products Co. *BP* 800,610
Nylon filaments are rendered bacteriostatic by treating them in an aqueous solution containing alcohol, a phenyl mercuric salt, e.g. phenyl mercuric acetate, and boric acid. The finish resists repeated washing. C.O.C.

Soil-resistant Pile Fabrics
Mohasco Industries *USP* 2,810,948
The pile is treated with a dilute colloidal solution of polyvinyl chloride, polyvinyl acetate, vinyl chloride–vinylidene chloride copolymer, polystyrene or styrene–butadiene copolymer so as to deposit 3% by wt. of dry solids as a coating on the fibres. C.O.C.

Transfer Method of Coating Fabrics
United States Rubber Co. *BP* 801,938
The coating film is cast from a highly "pseudo-plastic" material. This material is characterised by its flow properties, its high viscosity at low shear rates and its low viscosity at high shear rates, e.g. a mixture of a polyvinyl chloride–diethyl maleate copolymer, di-2-ethyl hexyl phthalate, TiO_2, Cd ricinoleate, Ba ricinoleate and an aliphatic solvent. While the film is still wet and on the casting surface the fabric is pressed against it, e.g. by passing the fabric and casting surface together under an idler pressure roller. This ensures that the film is not soaked up by the fabric nor the fabric pressed all the way through the film. C.O.C.

Treatment of Cloth before or after Coating with Metal by Evaporation in a Vacuum
W. Kunsch *BP* 800,093
The cloth is coated or impregnated before and/or after the deposition of the metal, with a resinous material having affinity for both the metal and the fibre. This results in better adhesion of the metal coating and also shortens the time needed for the cloth to be in the high vacuum coating apparatus. C.O.C.

Getting Better Adherence of Polyvinyl Chloride to Textiles
ICI *BP* 800,097
The textiles are treated with a vinylchloride–vinyl acetate copolymer and an organic poly*iso*cyanate before the polyvinyl chloride is applied. C.O.C.

Waterproof Composite Fabric
Plastic Film Corpn. *USP* 2,813,052
Woven or knitted fabric is coated on one side with a film of plastic without the body of the cloth being penetrated by the plastic. Machinery is described which enables this to be done with a minimum of, usually only two, coating operations. C.O.C.

Toxicity of Pentachlorophenol (III p. 784)
Recent Developments in Organic Derivatives of Titanium (III p. 785)
Practical Problems in the Processing of Textiles made from Polyester Fibres (VIII p. 804)
Printed and Embossed Rubber (XIII p. 810)
Coating Organic Polymers with Organic Material (XIII p. 810)

XI—PAPER AND OTHER CELLULOSIC PRODUCTS

Chemical Nature of Weak Bonds in the Cellulose Molecule. I—Effect of Carboxylic Groups in the Cellulose Molecule on the Stability of the Glucoside Linkage
V. I. Ivanov and Z. I. Kuznetsova
Izvestiya Akad. Nauk S.S.S.R., otdel khim. nauk, 646–648 (May 1958)
The investigation of model cpd., e.g. the Sr salts of D′-methoxy-D-hydroxymethyldiglycollic acid, or α-methyl-glucoside, has shown that the presence of COOH-group considerably decreases the stability of the acetyl linkage under acid conditions. The presence of two carboxylic acid groups in 2:3-position are assumed to be responsible for the weakening of the glucoside linkage in the cellulose molecule in acidic media. G.J.K.

Comparative Reactivity of Hydroxyl Groups of Cellulose. VII—Distribution of Methoxyl Groups in partially Methylated Cellulose, obtained from Cellulose treated with Sodium *iso*Amylate
V. Derevitskaya, M. Prokof'eva, and Z. Rogovin
J. Gen. Chem. U.S.S.R., 28, 1368–1371 (May 1958)
The reaction of cellulose with sodium *iso*amylate and subsequent methylation shows that under these conditions the secondary hydroxyl group has the greater reactivity; thus, the measure of the methoxyl group shows it to be present on the secondary carbon atom to the extent of 2–5 times greater than on the primary carbon atom. G.J.K.

Xanthation of Cellulose
A. A. Konkin and Yu. A. Rŷmashevskaya
J. Appl. Chem. U.S.S.R., 31, 459–465 (March 1958)
The xanthation of cellulose with CS_2 takes place very quickly (< 5 min.) when both reactants are kept in soln. The speed of the formation of cellulose xanthate is greatly diminished when the reacting substances remain in an emulsion. It is also governed by the state of the CS_2 in the reaction sphere and the structure of the cellulose used. In both cases of etherification the speed of the reaction varies in the order: viscose rayon > sulphite cellulose > cotton. T.Z.W.

Acetylation and Nitration of Cellulose utilising Sulphamic Acid as Catalyst. I—Liquid-phase Acetylation with Glacial Acetic Acid and Acetic Anhydride
M. Isozaki and N. Ishikawa
Rept. Govt. Chem. Ind. Research Inst. Tokyo, 53, 120–123 (xiii) (April 1958)
The action of sulphamic acid on cellulose and metals is weaker than that of sulphuric acid, and metallic salts of sulphamic acid are more soluble in water than sulphuric acid. Sulphamic acid may be used as an excellent catalyst for the acetylation of cellulose. Several data necessary to acetylation, such as the sorptions of sulphamic acid by cellulose in water and acetic acid, the solubilities in acetic acid, acetic anhydride, and acetic acid–acetic anhydride mixtures, and the corrosive action of acetylation mixtures on copper, aluminium, and stainless steel were obtained. The best conditions for obtaining a good quality of cellulose acetate were— quantity of sulphamic acid 3% by wt. on the cellulose and a reaction temp. of 50–60°C. C.J.W.H.

Estimation of Alkoxide Groups in Water-free Alkali Celluloses
E. Geiger and H. Nobs
Helv. chim. Acta, 41, (V), 1295–1299 (Aug. 1958)
In dried alkali celluloses which have been prepared respectively from lithium, sodium, and potassium hydroxides, there is proportionality between the amount of total alkali accepted and the number of alkoxide groups formed. By shaking dried water-free alkali celluloses with methanol, the alkali of the cellulose is removed as methyl alcoholate (lithium, sodium, or potassium methoxide respectively). The maximum number of OH groups which have reacted depends on the alkali employed. H.H.H.

Ageing and Thermo-oxidational Decomposition of Ethylcellulose
O. P. Kozinina and V. I. Kurlyankina
J. Appl. Chem. U.S.S.R., 31, 601–608 (April 1958)
The destruction of ethylcellulose on heating is due to its oxidation by the oxygen of the air. In the absence of oxygen the compound is stable under similar conditions. The oxidation of ethylcellulose is characterised by the presence of an induction period of varying length depending upon the temp. and the time of its storage. The process of destruction is conditioned by the decomposition of the ether peroxide arising from the combination of the molecule of oxygen with ether groups. The formation of the peroxide groups takes place at room temp. under the storage conditions. The thermal decomposition lowers the mol.wt. of the cellulose derivative, the ethoxy groups break off as acetaldehyde and ethyl alcohol, and formic acid, ethylformate, and CO_2 are formed. Carboxy and carbonyl groups originate in the ethylcellulose molecule. T.Z.W.

Coating Organic Polymers with Organic Material (XIII p. 810)

XII— LEATHER; FURS; OTHER PROTEIN MATERIALS

Aniline Finish Leather
O. Murtfeld

Leder, **8**, 245 (1957):
J. Soc. Leather Trades Chem., **42**, 264 (July 1958)

A broad review of the problems involved in manufacture. C.J.W.H.

Molecular Weight of Condensed Tannins as a Factor determining their Affinity for Collagen
D. G. Roux

Nature, **181**, 1793–1794 (28 June 1958)

There is a linear relationship between the average mol. wt. of condensed tannin fractions and their R_M (defined as $\log\left(\frac{1}{R_F}-1\right)$) values both under absorption conditions (in aqueous media) and partition conditions (in *n*-butanol–acetic acid–water, 6:1:2). Molecular weight increases with decreasing R_F value over the ranges 550–3200 for black wattle bark tannins and 790–2350 for quebracho heartwood tannins. Evidence is cited which suggests the operation of physical forces between tannins and cellulose or collagen, analogous with those obtaining between cellulose and dyes. In many cases paper chromatography may be used to interpret the relative affinities of tannins for collagen. J.W.D.

PATENT

White Leather by Tanning with Zinc Sulphide or Sulphhydrate
American Zinc, Lead & Smelting Co. *USP* 2,809,878

The hide is treated first with a water-soluble sulphide or hydrosulphide and then with an aqueous solution of a zinc salt. This yields a white leather of better colour and better stability than alum tanned leather and of much better fastness to leaching. C.O.C.

Felting Investigations. I— Potential Substitutes for Rabbit Fur in Hat Felts (VI p. 798)

Dyeing Glacé Kid Black (VIII p. 804)

XIII— RUBBER; RESINS; PLASTICS

Hetero-chain Polyesters

XI— Chemical Decomposition of Polyethylene Terephthalate
V. V. Korshak, N. I. Bekasova, and V. A. Zamyatina

Izvestiya Akad. Nauk. S.S.S.R., otdel. khim. nauk, 614–617 (May 1958)

The decomp. of polyethylene terephthalate (I) in cresol solution at different temp. is investigated and it is found that above 110°C. decomp. of the polyester sets in. Acidolysis and glycolysis of I in diphenyl soln. at 200°C. in the presence of adipic acid (II) and ethylene glycol (III) is investigated. It is shown that the degree of decomp. is increased with increasing concn. of either II or III.

XII— Polyesters of Terephthalic and *iso*Phthalic Acids and Aromatic Dihydroxy Compounds
V. V. Korshak and S. V. Vinogradova

Ibid., 637–640

The polycondensation of phthalic acids with hydroquinone, *pp'*-dihydroxydiphenylpropane, and 1:5- and 1:6-dihydroxynaphthalene is investigated, and the influence of the structure of the initial components on the properties of the polyesters is discussed. G.J.K.

Method for obtaining Initiated Copolymers
V. V. Korshak and K. K. Mozgova

Izvestiya Akad. Nauk S.S.S.R., otdel khim. nauk, 651 (May 1958)

The treatment of a polyamide film with ozone and a vinyl monomer produces a strongly bound (grafted) surface layer of polystyrene which cannot be removed by boiling for some hours with benzene or other organic solvents. The grafting process is initiated by the presence of peroxide groups on the polyamide surface. The mechanical properties of the graft film depend on conditions and length of treatment. This method has been applied to heterogeneous polyamides, e.g. poly-*ε*-caproamide, and also to polyesters, e.g. polyethylene terephthalate. G.J.K.

Mechanics of Polymer Molecules
G. A. Patrikeev

Doklady Akad. Nauk. S.S.S.R., **120**, 339–342 (11 May 1958)

A summary is given of some of the important points in physicochemical mechanics (mechanochemistry) related to mechanical action on polymers. G.J.K.

PATENTS

Printed and Embossed Rubber
Boston Woven Hose & Rubber Co. *BP* 800,080

Ink is applied to the raised portions of an embossing surface, preferably an embossing cylinder, so that when plastic sheeting is embossed it is also printed. As the colour is applied only to the depressed portions of the embossed surface, it provides a decoration of long service life. C.O.C.

Plasticised and Heat and Light Stabilised Vinyl Halide Polymers
Union Carbide Corpn. *BP* 800,309

Compounds of formula—

$$(C_nH_{2n-1}O)\cdot CH\cdot CO\cdot OR^1$$
$$\quad\quad\quad

Embossing Thermoplastic Film
United Plastics Industries *BP* 800,598–9
An embossing drum has a porous surface. Suction is applied to the interior of the drum so as to emboss softened thermoplastic film passing around part of the drum. Means are provided to prevent loss of embossing suction caused by leakage of air into the drum through parts of the drum's surface not in contact with the plastic. C.O.C.

Stable Solid Water-soluble Aminoplast Condensates (III p. 786)

Aqueous Emulsion of Poly(vinyl Acetate) yielding Coatings of Improved Resistance to Fire (III p. 786)

Poly(vinyl Acetate) Emulsions Stabilised with Hydroxyethyl Cellulose (III p. 786)

Polyamides dissolved in Aqueous 2-Chloroethanol—Coating Compositions (III p. 786)

Tetramethyldiamino-2-propanol for Stabilising Alkenyl Aromatic Resins to Weathering (III p. 786)

XIV—ANALYSIS; TESTING; APPARATUS

Establishing a Radiochemical Laboratory
I. A. Berstein
Amer. Dyestuff Rep., **47**, P 297–P 298 and P 309 (5 May 1958)

Determination of Small Amounts of *o*-Phenylphenol
D. Harvey and G. E. Penketh
Analyst, **82**, 498 (1957): *J. Soc. Leather Trades Chem.*, **42**, 265 (July 1958)
Methods are described employing (1) ultraviolet spectrophotometry, (2) colorimetry, and (3) fluorescent measurement. C.J.W.H.

Paper Chromatography of Azoic Coupling and Diazo Components
S. Kitahara and H. Hiyama
Kógyó Kagaku Zasshi, **59**, 1183–6 (1956): *Chem. Abs.*, **52**, 13265 (10 Aug. 1958)
Twenty-one azoic coupling components were paper-chromatographed with 5% NH_4OH and alcohol (3:1) as developing agent and diazo-*p*-chloroaniline as colouring agent. An inversely linear relation was observed between R_f values and affinity for cellulose. Thirty-one azoic diazo components were also paper-chromatographed using 2% HCl for monoamino compounds and, for compounds containing NO_2 and N:N, butanol–HCl (4:1) as developing agents and 1-naphthol-4-sulphonic acid as colouring agent. R_f values and colours for both the coupling and diazo components are given in tables. C.O.C.

Paper Chromatography of the Reduction Products of Monoazo Dyes
S. Fujii, M. Kamikura, and Y. Hosogai
Eisei Shikenjo Hókoku, (75), 29–31 (1957): *Chem. Abs.*, **52**, 12685 (10 Aug. 1958)
The dye (0·1 g.) is dissolved in water or alcohol and then reduced till colourless by adding 10% aq. Na hydrosulphite drop by drop. The colorised solution (0·01 ml.) is placed on Toyo filter paper No. 50, 8 × 40 cm. and developed by the ascending method using a mixture of butanol with pyridine–water, alcohol–water, or alcohol. The alcohol–water may be acid, neutral or alkaline. Butanol–alcohol–0·5 N-NH_4OH (6:2:3) (Solvent 1) and butanol–alcohol–0·5 N-acetic acid (6:2:3) (Solvent 2) were the most useful of 7 solvent mixtures tested. The method is applicable only to identifying a single dye and not to a mixture. The R_f values of the reduction products of the 7 dyes tested are—Solvent 1—Tartrazine 640 → sulphanilic acid (I), 0·30, + 1-(4-sulphophenyl)-3-carboxy-4-amino-5-hydroxypyrazole (II) 0·05; Amaranth 184 → naphthionic acid (III) 0·45, + 1-amino-2-naphthol-3:6-disulphonic acid (IV) 0·04; Orange I 150 → I, + 1-amino-4-naphthol (V) 0·95; New Coccine 185 → III, + 1-amino-2-naphthol-6:8-disulphonic acid (VI) 0·05; Ponceau R 79 → *m*-xylidine (VII), 0·92, + IV; Sudan I 24 → aniline (VIII) 0·90, + 1-amino-4-naphthol (IX) 0·91; Acid Orange R 28 → VIII + IV. Solvent 2—I 0·29, II 0·05, III 0·40, IV 0·07, V 0·90, VI 0·13, VII 0·91, VIII 0·90 and IX 0·94. C.O.C.

Colorimetric Determination of C.I. Azoic Coupling Component 2 and Affinity of C.I. Azoic Coupling Component 2 for Cotton
T. Urahata
Kógyó Kagaku Zasshi, **59**, 1168–1171 (1956): *Chem. Abs.*, **52**, 13266 (10 Aug. 1958)
The concentration of C.I. Azoic Coupling Component 2 was measured by colorimetric examination of an aqueous solution of the dye produced by coupling it with excess diazo sulphanilic acid. The pH, time of standing after coupling and amount of diazo component used affect the results but in presence of NaCl, HCHO and Turkey Red it has no effect. The most practical conditions are to use 10% excess of acid, stand for 12 hr. and carry out the colorimetric examination at pH 12·6. The adsorption of C.I. Azoic Coupling Component 2 by cotton follows the Freundlich equation. The affinity of the coupling component on cotton at 20 and 30°C., respectively, was calculated, with some assumptions, to be 3·17 and 3·06 kcal/mole, respectively. The heat of dyeing was 6·3 kcal/mole. C.O.C.

Paper Chromatography of Reduction Product of Azoic Pigments
S. Kitahara and H. Hiyama
Kógyó Kagaku Zasshi, **59**, 1187–9 (1956): *Chem. Abs.*, **52**, 13265 (10 Aug. 1958)
Twenty-one azoic pigments were decomposed by $SnCl_2$–HCl in butanol or by alkaline hydrosulphite in pyridine. They were then paper chromatographed using butanol–ethanol–water (3:1:1) as developing agent. The diazo components of these pigments were examined for R_f and colour on paper except for some which were difficult to identify. Similar treatment of various azoic dyeings on cotton gave satisfactory identification of the components of the dyes present. C.O.C.

Oxidimetric Determination of Malachite Green (C.I. Basic Green 4) with Ceric Sulphate
M. Matrka and V. Hanousek
Chem. Listy, **52**, 755–7 (1958): *Chem. Abs.*, **52**, 12684 (10 Aug. 1958)
Oxidation proceeds quantitatively with the hydrated dye. Dissolve the dye (0·5 g.) in water (100 ml.) and stir in N-NaOH (10 ml.). After 20 min. filter off the carbinol base on a sinter funnel, wash the precipitate with 0·1 N-NaOH (20 ml.), dissolve the precipitate in N-H_2SO_4 (50 ml.) and dilute with water (100 ml.). Titrate a 10-ml. aliquot with 0·1 N-$Ce(SO_4)_2$ potentiometrically (1 ml. = 8·66 mg. carbinol base or 12·07 of the oxalate of the dye). With Crystal Violet (C.I. Basic Violet 3) the end point is not sharp. With Methyl Violet (C.I. Basic Violet 1) which is not homogeneous, the free NH_2 groups of the tetramethylparafuchsin are also oxidised. Commercial sulphonated dyes containing oxidisable substances cannot be determined by this method. C.O.C.

Identification of 2:1 and 1:1 Metal-complex Dyes on the Fibre
Anon.
A.Q.T. Boletin Técnico Informativo, **3**, (8), 8 (1958)
A blue or green borax-bead test on the ashed pattern indicates metal-complex dye. Deep blue is given by Cibalans containing Co. The pattern is then boiled with dilute ammonia solution until bleeding is strong. The fibres are rejected, and the solution acidified with HCl or H_2SO_4 and cooled. A little ether is added, and the mixture shaken. If the ether layer becomes coloured the presence of Cibalan dyes is indicated. Ultralan dyeings illuminated by a tungsten filament lamp show a characteristic redness when viewed through cobalt glass. S.R.C.

Abrasion Testing of Textiles
O. Schickhardt and F. Strecker
Textil-Praxis, **13**, 572–577 (June 1958)
Abrasion tests to determine wearing characteristics of textiles are becoming increasingly popular. Despite ample literature on the subject and the development of numerous testing devices there are still many problems to be solved, especially in the evaluation of results of the tests and their correlation with wearing trials. The present report deals with the results of investigations conducted by the German Research Institute for the Textile Industry (Deutches Forschungsinstitut für Textilindustrie) in Reutlingen–Stuttgart. L.A.T.

Determination of Very Small Amounts of Mercury in Synthetic Food Dyes

H. Onrust

Chem. Weekblad, **53**, 383–386 (1957): *Chem. Abs.*, **52**, 13126 (10 Aug. 1958)

Enforcement of a Dutch law of 1956 requires means for determining 0·5 μg. Hg/g. food dye. Previously published methods inadequately destroy the organic matter and yield low results because of adsorption of Hg on the residual organic matter. Wet ashing is done in a flask connected to a dropping funnel and the extraction chamber of a Soxhlet extractor, surmounted by a condenser. The food dye (5 g.) is placed in the flask and boiled for 10 min. with 30 ml. of mixed acids (equal parts (wt. or vol. not stated) of H_2SO_4, HNO_3 and water). Distillation is continued into the Soxhlet chamber until white fumes are formed. HNO_3 (25 ml. or 40 ml. if a triphenylmethane dye is being ashed) is added through the dropping funnel at a drop per sec., the rate of heating is adjusted so that brown vapours are formed and no carbonisation caused. If white fumes are formed or evolution of brown vapours cease then the rate of addition of HNO_3 is increased. Finally the rate of heating is increased to cause distillation. When all the HNO_3 is added, the ashing flask is allowed to cool somewhat and the distillate returned to the flask. The contents are again distilled until white fumes are evolved. The flask is cooled, 10 ml. of a mixture of equal parts of HNO_3 and $HClO_4$ added, boiled for 10 min. and distilled into the Soxhlet chamber until white fumes are formed. Heating is continued until the residual organic matter is destroyed. If the cold solution is not colourless it must be reheated. The acids in the extractor chamber are returned to the flask and the condenser, extractor, and adapter washed with water. The combined residual liquid and washings are refluxed, 5 ml. of urea solution (40 g./100 ml.) added through the condenser and the whole boiled for 15 min. The solution is then cooled and brought to 500 ml. The Hg is extracted and determined with dithizone with 200 ml. aliquots of the solution by standard procedures. The method gave good results with all food dyes tested except Erythrosine (C.I. Food Red 14). This dye contains 50% iodine which is liberated during the oxidation of the organic matter. If the iodine is reduced to HI, the Hg is rendered unavailable for determination because a HI–Hg complex is formed. C.O.C.

Separation of Chlorophylls (C.I. 75810) by Paper and Cellulose Column Chromatography

A. Angapindu, H. Silberman, P. Tantivatana, and I. R. Kaplan

Arch. Biochem. Biophys., **75**, 56–68 (1958): *Chem. Abs.*, **52**, 12978 (10 Aug. 1958)

Two methods have been developed for separating plastic pigments by paper chromatography. The first is based on the reversed-phase procedure and uses Whatman No. 4 paper impregnated with paraffin with methanol as the irrigation solvent. The second is an improvement on existing methods and consists in use of circular chromatography on unimpregnated paper to repress tailing. Cellulose columns were also successfully used. By combining these methods it is possible to identify and separate in a state of spectroscopic purity the natural chlorophylls and some of the carotenoids. Conditions are discussed to avoid determination of the sensitive pigments during irrigation and elution. C.O.C.

Analysis of Paints, Lacquers, and Varnishes

N. W. Hanson

J. Oil & Col. Chem. Assocn., **41**, 203–257 (March 1958)

Methods are described for the separation and analysis of the pigment and solvent phases of paints and lacquers. General tests are given for the identification of the binder, together with special tests for cellulose nitrate, and natural resins. Detailed analyses of alkyds, oil-type non-alkyds, cellulose derivatives, vinyl and acrylic polymers, polyamides and polyurethanes, and amide–formaldehyde resins, are given. A number of specimen analyses are discussed in detail; these include—determination of pigment content; analysis of a pigment mixture, of a solvent mixture, of a resin soln., of varnish films, of a black stoving car finish, of a plasticiser for cellulose acetate, and of some vinyl-type resin soln. The identification of minor constituents in emulsion paints is also discussed. A very useful survey, with 12 tables and 54 references to the literature. J.W.D.

Electronic Instruments for Textile Processes

R. Hosmer

Amer. Dyestuff Rep., **47**, P 329–P 332 (19 May 1958)

Electronic instruments are discussed for the measurement of temperature, pressure, electrolytic conductivity, pH, redox potential, dielectric constant, flow velocity. Gas chromatography is mentioned. P.T.S.

Estimation of Lanthionine in Wool as Lanthionine Sulphoxide

G. Decroix and G. Mazingue

Bull. Inst. Text. France, (73), 41–52 (April 1958)

Lanthionine (I) present in hydrolysates of wool is oxidised to the sulphoxide (II) with H_2O_2. Chromatography on paper for 4 days in *n*-butanol : acetic acid : water (4 : 1 : 5) gives good separation of II from cysteic acid. The spots, located with the aid of reference standards, are cut out and II eluted and determined colorimetrically with ninhydrin. Known amounts of II are run on the same chromatogram and a standard curve constructed. By way of illustration, the method is applied to investigate (*a*) the formation of I by the action of Na_2CO_3 soln. on wool, and (*b*) the formation of I when wool is steamed. J.C.F.

Twist Set of Wool Fibre Bundles

F. Bekku, N. Azuma, and T. Itō

J. Soc. Textile Cellulose Ind. Japan, **14**, 111–116 (Feb. 1958)

The twist set of wool fibre bundles is a conveniently measurable property for determining the set of individual wool fibres, which must be important in the setting of wool fabrics. The method described gives reproducible values for the set of wool fibres under small deformations corresponding to those in wool fibres in wool fabrics closer than those in the conventional method, which determines set under extensions as large as 30% or more. The relation between t, the time of treatment in a bath at temperature T, and S, the degree of set stable to water at room temperature, is of the form—

$$S = a + b \log t$$

where a and b are constant at any given temperature, but increase linearly with increasing T. Hence, for any fixed time of treatment, S also increases linearly with T. The degree of set usually increases with increasing pH, although above pH 3 there is a range within which a constant amount is obtained. This range narrows as temperature increases: e.g. at 40°C. there is a set of 20% up to pH 9; at 70°C. it is ~ 30% up to pH 6·5; but at 97°C. there is only a point of inflection at 45%, the set increasing to about 95% at pH 8 and remaining constant at higher pH values. L.P.

Photoconductivity and the Visual Receptor Process

B. Rosenberg

J. Opt. Soc. Amer., **48**, 581–582 (Aug. 1958)

In testing theories of a transducing mechanism as a primary visual receptor process, photoconductivity has been demonstrated across thin films of β-carotene glass or crystalline powder, irradiated, under an applied voltage, with a tungsten lamp. Preliminary characterisation of the response curves shows sufficiently varied effects to imply that an account of colour vision could be obtained from the response of a single organic semi-conductor. R.B.B.

Preparation and Properties of some Aryl Derivatives of Thioxanthenol 5-Dioxide possessing Indicator Properties (IV p. 789)

Determination and Importance of Pigment–Volume Concentration (V p. 796)

Opacification of Enamels, Glasses, and Glazes (V p. 797)

Inherent Resistance of Wool (VI p. 798)

Rate of Wetting of Textiles by Detergent Systems (VII p. 799)

Afterchroming of Acid Chrome Dyes on Wool (VIII p. 803)

Chlorination of Wool Cheeses (X p. 807)

Estimation of Alkoxide Groups in Water-free Alkali Celluloses (XI p. 809)

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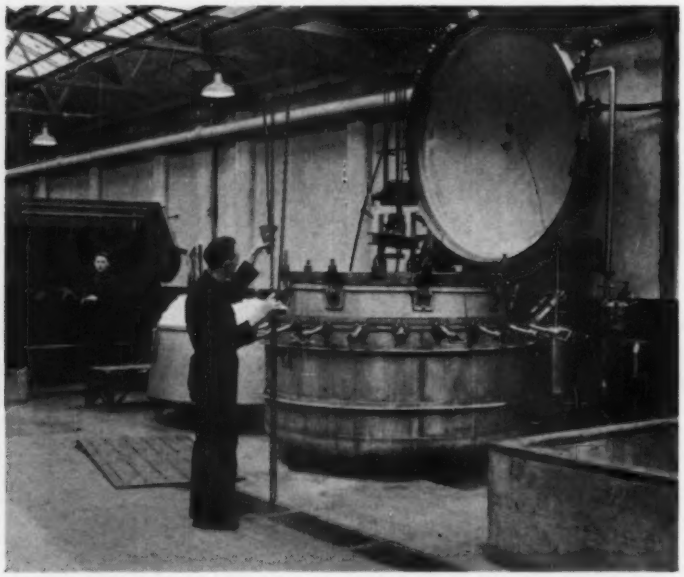
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FORTHCOMING MEETINGS OF THE SOCIETY—*continued from page viii*

Tuesday, 10th February 1959

NORTHERN IRELAND SECTION. *Emulsion Thickenings—Possibilities in Textile Printing.* T. L. Dawson, Esq., B.Sc., Ph.D., A.R.I.C. (Imperial Chemical Industries Ltd.). Grosvenor Rooms, **Belfast.** 7.30 p.m.

SCOTTISH SECTION. *The Use of Antistatic Agents in Textile Processing.* A. E. Henshall, Esq., B.Sc. (Imperial Chemical Industries Ltd.). (Joint meeting with the Textile Institute.) St. Enoch Hotel, **Glasgow.** 7.15 p.m.

Thursday, 12th February 1959

WEST RIDING SECTION. *New Ideas in the Application of Phthalocyanine Derivatives to Textiles.* Dr. F. Gund. (Farbenfabriken Bayer). Griffin Hotel, Boar Lane, **Leeds.** 7.30 p.m.

Tuesday, 17th February 1959

HUDDERSFIELD SECTION. *The Use of Antistatic Agents in Textile Processing—Advantages and Disadvantages.* A. E. Henshall, Esq., B.Sc. (Imperial Chemical Industries Ltd.) Silvios Cafe, **Huddersfield.** 7.30 p.m.

Thursday, 19th February 1959

MANCHESTER JUNIOR BRANCH. *Chlorite Bleaching.* W. J. Watts, Esq., B.Sc. Room J/B 16—Chemical Engineering Building (Jackson Street), College of Science and Technology, **Manchester.** 4.30 p.m.

SCOTTISH JUNIOR BRANCH. *Colour Vision.* Dr. Mary Collins (Department of Psychology, Edinburgh University), also *How the World Looks to a Colour Defective* (a short colour film obtained through the courtesy of the Department of Naval Research, United States of America). Technical College, **Paisley.** 7.30 p.m.

Friday, 20th February 1959

MANCHESTER SECTION. *Emulsion Thickenings. Possibilities in Textile Printing.* T. L. Dawson, Esq., B.Sc., Ph.D., A.R.I.C., F.C.S. (Imperial Chemical Industries Ltd.). The Textile Institute, 10 Blackfriars Street, **Manchester.** 7 p.m.

Wednesday, 25th February 1959

BRADFORD JUNIOR BRANCH. *Vat Dyeing of Cotton Piece Goods by Pre-pigmentation Routes.* M. R. Fox, Esq., F.T.I., F.S.D.C. and J. F. Mawson, Esq., B.Sc. (Imperial Chemical Industries Ltd.). Institute of Technology, **Bradford.** 7.15 p.m.

Thursday, 26th February 1959

WEST RIDING SECTION. *Fast Shades on Wool–Cellulose Unions.* D. R. Lemin, Esq., B.Sc. (Imperial Chemical Industries Ltd.). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Friday, 6th March 1959

LONDON SECTION. *The Use of Antistatic Agents in Textile Processing.* A. E. Henshall, Esq., B.Sc. (Imperial Chemical Industries Ltd.). The Royal Society, Burlington House, **London W.1.** 6 p.m.

MIDLANDS SECTION. Section Annual Dinner. George Hotel, **Nottingham.**

Tuesday, 10th March 1959

LEEDS JUNIOR BRANCH. *New Methods for the Assessment of Dyeing Properties and Usability of Dyes.* G. H. Lister, Esq., B.Sc., Ph.D. Lecture Theatre, Department of Colour Chemistry and Dyeing, The University, **Leeds.** 3.15 p.m.

NORTHERN IRELAND SECTION. *Stenter Drying.* T. A. Uthwatt, Esq., B.A., A.M.I.E.E., and J. S. Woollatt, Esq., B.Sc. (Mather & Platt Ltd.). Grosvenor Rooms, **Belfast.** 7.30 p.m.

SCOTTISH SECTION. Annual General Meeting. 7 p.m. Followed by *Modern Cloth Drying Principles and Machines.* K. S. Laurie, Esq., A.M.I.Mech.E., A.M.I.E.E. (John Dalglish & Sons Ltd.). St. Enoch Hotel, **Glasgow.** 7·15 p.m.

Wednesday, 11th March 1959

SCOTTISH JUNIOR BRANCH. Annual General Meeting 7 p.m. *Dyeing Unions Containing Acrylic Fibres.* B. Kramrisch, Esq., F.R.I.C., F.T.I., F.S.D.C. (Ciba Clayton Ltd.). Technical College, **Paisley.** 7.30 p.m.

Thursday, 12th March 1959

BRADFORD JUNIOR BRANCH. *Sizing Materials—Their Chemistry and Application.* J. H. MacGregor, Esq., Ph.D., F.R.I.C., F.C.S. (Courtaulds Ltd.). Institute of Technology, **Bradford.** 7.15 p.m.

Thursday, 12th March 1959

MIDLANDS SECTION. *Dyeing and the Future.* J. Boulton, Esq., M.Sc.Tech., F.R.I.C., F.T.I., F.S.D.C., President of the Society. (Joint meeting with the Coventry Textile Society.) Courtauld's Acetate and Synthetic Fibres Laboratory, Lockhurst Lane, **Coventry.** 7 p.m.

Thursday, 12th March 1959

SCOTTISH SECTION. *The Reactivity of Keratin.* Professor J. B. Speakman, D.Sc., F.R.I.C., F.T.I., F.S.D.C. Scottish Woollen Technical College, **Galashiels.** 7.30 p.m.

WEST RIDING SECTION. *The Sorption of Moisture by Fibre-forming Polymers.* L. Valentine, Esq., B.Sc., Ph.D. (Tootal Broadhurst Lee Co. Ltd.). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Saturday, 14th March 1959

BRADFORD JUNIOR BRANCH. Annual General Meeting. Institute of Technology, **Bradford.** 10.15 a.m.

Tuesday, 17th March 1959

HUDDERSFIELD SECTION. *Fast Shades on Wool–Cellulose Unions. Recent Advances in this Field.* D. R. Lemin, Esq., B.Sc. (Imperial Chemical Industries Ltd.). Silvios Cafe, **Huddersfield.** 7.30 p.m.

Wednesday, 18th March 1959

MIDLANDS SECTION. *Photoelectric Colorimeters . . . their uses and limitations in the Dyehouse.* J. V. Alderson, Esq., B.Sc., A.R.C.S. (Joint meeting with the British Association of Chemists.) Midland Hotel, **Derby.** 7 p.m.

Thursday, 19th March 1959

MANCHESTER JUNIOR BRANCH. Films—*Silk. Principles of Chromatography. How the World Looks to a Colour Defective.* Room J/B 16—Chemical Engineering Building (Jackson Street), College of Science and Technology, **Manchester.** 4.30 p.m.

Friday, 20th March 1959

MANCHESTER SECTION. *Symposium on Re-active Dyes.* College of Science and Technology, **Manchester.** Further details later.

Thursday, 2nd April 1959

MIDLANDS SECTION. *Colour Physics and Match Prediction.* (Lecturer to be announced later.) (Joint meeting with the Textile Institute.) Carpet Trades Ltd. Canteen, **Kidderminster.** 7 p.m.

Friday, 3rd April 1959

LONDON SECTION. *Recent Developments in Dyeing.* T. Vickerstaff, Esq., M.Sc., Ph.D., F.S.D.C. (Imperial Chemical Industries Ltd.). George Hotel, **Luton.** 7 p.m.

Thursday, 9th April 1959

WEST RIDING SECTION. Annual General Meeting. Colour Film on *How the World Looks to a Colour-defective.* Victoria Hotel, Bridge Street, **Bradford.** 1

Friday, 10th April 1959

The Society's Annual General Meeting and Dinner, Grand Hotel, **Leicester.**

Wednesday, 15th April 1959

MIDLANDS SECTION. Annual General Meeting of the Section followed by a showing of New Scientific Films. King's Head Hotel, **Loughborough.** 7 p.m.

Thursday, 16th April 1959

MANCHESTER JUNIOR BRANCH. Three short papers by members of the section. Room J/B 16—Chemical Engineering Building (Jackson Street), College of Science and Technology, **Manchester.** 4.30 p.m.

Friday, 17th April 1959

MANCHESTER SECTION. Annual General Meeting. *Stenter Drying.* A. T. Uthwatt, Esq. (Mather & Platt Ltd., Research Dept.). The Textile Institute, **Manchester.** 7 p.m.

Tuesday, 21st April 1959

HUDDERSFIELD SECTION. Annual General Meeting. Followed by a Colour Film on *How the World Looks to a Colour-defective.* Cmdr. Dean Farnworth (United States Naval Research). Silvios Cafe, **Huddersfield.** 7.30 p.m.

Friday, 24th April 1959

LONDON SECTION. Annual General Meeting. Commander Dean Farnworth (United States Navy) will show and discuss his film *How the World Looks to a Colour-defective.* Waldorf Hotel, **London W.C.2.** 6 p.m.

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Candidates, preferably in the age group 30–35, should have had several years' practical experience in the Textile Industry, and a background of the wet processing of cotton, rayon and synthetic fibres is desirable. Apart from his technical qualifications, the candidate must be keen to sell, and to the right man the Company is offering an interesting and progressive position.

The candidate would be required to live in the area. Remuneration to be paid would be dependent upon age and experience, and the Company would provide a car. A contributory Pension Scheme in operation. Applications in the first instance to the Laporte Group Personnel Manager, Laporte Industries Ltd., Hanover House, 14 Hanover Square, London W.1., quoting Ref. LCL/JDC1/31.

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Biggins, L., *formerly of* 10 Colson Drive, Alkrington, Middleton, *to* 221 Manchester New Road, Alkrington, Middleton, Manchester

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Butterworth, J. F. D., *formerly of* Burlington Drive, Davenport, Stockport, Cheshire, *to* 26 Taunton Road, Bridgwater, Somerset

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Gauchat, Dr. M., *formerly of* Ciba Company Pty. Ltd., Box 22, P.O. East Brunswick, Melbourne, Victoria, Australia, *to* General Manager, Ciba Company Pty. Ltd., Caltex House, 167 Kent Street, Sydney, Australia

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Harris, A., *formerly of* Laurel Bank, 36 High Street, Newton-le-Willows, Lancs., *to* 143 Newchurch Road, Rawtenstall, Rossendale, Lancs.

Johnson, F. D., *formerly of* 14 Senlac Road, Lee, London S.E.12, *to* 82 Manley Road, Whalley Range, Manchester 16

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Sykes, C. A. S., *formerly of* 75 Reinwood Road, Lindley, Huddersfield, *to* 27 Fir Road, Paddock, Huddersfield

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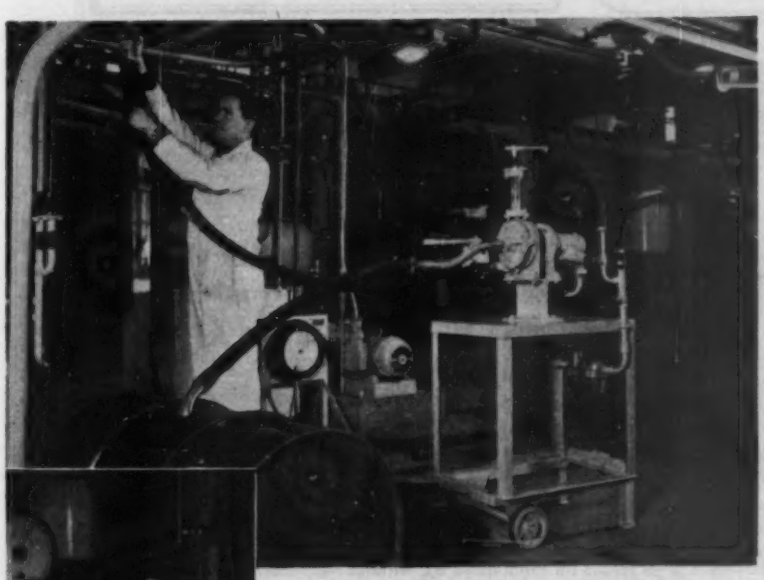
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Photographs taken in their Beeston factory by courtesy of Boots Pure Drug Co Ltd

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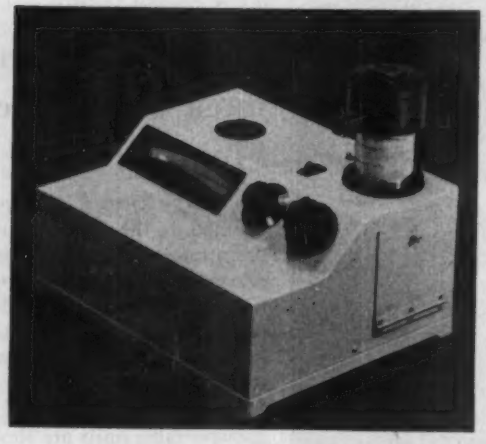
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The Measurement of Colour by Professor W. D. Wright gives a full explanation of the C.I.E. system and deals in detail with the theory of colour and its measurement. The second edition of Professor Wright's book — which has just been published — has been reset and largely rewritten — *Price 52s net.*

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INTERNATIONAL FEDERATION OF ASSOCIATIONS OF TEXTILE CHEMISTS AND COLOURISTS

1959 INTERNATIONAL CONGRESS IN LONDON

Patron—H R H The Duke of Edinburgh K.G K.T

The first visit to England by the International Federation of Associations of Textile Chemists and Colourists will be made in 1959 when the *host member Society* will be The Society of Dyers and Colourists

The Congress will be held on
WEDNESDAY THURSDAY FRIDAY 16 17 18 SEPTEMBER 1959
with the Congress centre at
CHURCH HOUSE, DEAN'S YARD, WESTMINSTER, LONDON
where international language translations will be available by speech amplification and simultaneous interpretation ear-phone equipment connected to all seats

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During the Congress the social events will include
A Reception at Guildhall
A Dinner and Gala Ball in The Great Room, Grosvenor House

The social events will also include excursions and special attractions for the ladies

Already heavy advance reservations have been received for tickets and all interested are invited to communicate with —

THE GENERAL SECRETARY THE SOCIETY OF DYERS AND COLOURISTS
DEAN HOUSE · 19 PICCADILLY · BRADFORD 1 · YORKSHIRE · ENGLAND

Record of Proceedings of the Perkin Centenary

held in London in May 1956

Arrangements have been concluded whereby the proceedings of the Perkin Centenary are being published by Pergamon Press Limited, of 4 Fitzroy Square, London W.1, at the price of 2 gns. per volume. The Publishers have undertaken to donate to the Perkin Centenary Trust a generous proportion of the profits arising out of sales of this volume.

In addition to the four Perkin Lectures which formed such an important part of the Centenary Celebration, the volume contains a Foreword by Sir Robert Robinson F.R.S. and the speeches given at the Centenary Banquet. It also includes a list of the contributors to the Perkin Centenary Fund (now the Trust).

Subscribers to the Perkin Centenary Fund and Sponsoring Bodies should address their orders to the General Secretary at the Society's Offices, and others should make application direct to the Publishers.

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of the
Society of Dyers and
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